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Planning Model for School Facilities. A Planning Model for a Secondary School Utilizing a Multi-dimensional Approach for Optimum Flexibility.

Chelmsford Park High School, Chelmsford, Mass.

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That the construction of a multi-million dollar school plant should be the result of the community's best possible thought, since concrete and steel are not suitable media for necessary future changes in the educational environment, is the basic philosophy of this report. Architects, administrators, teachers, school committeemen, and consultants all participated in designing both a new physical plan and a compatible curriculum. This was accomplished without a communications gap among the participants by the employment of a physical model of a proposed school plan. By observing the physical model with movable elements and simulation techniques, planners were able to comprehend more quickly and relate the number of variables present in curriculum change, new course structure, or the design of the building to house instructional programs. The educational specifications for the Chelmsford Park High School are included as are recommendations for simulation as an instructional tool. The appendices include a section on teacher training (a system concept for developing teacher empathy), a sample community questionnaire, and the planning schedule for the proposed high school. A bibliography of sources on school planning is also included. (NI)

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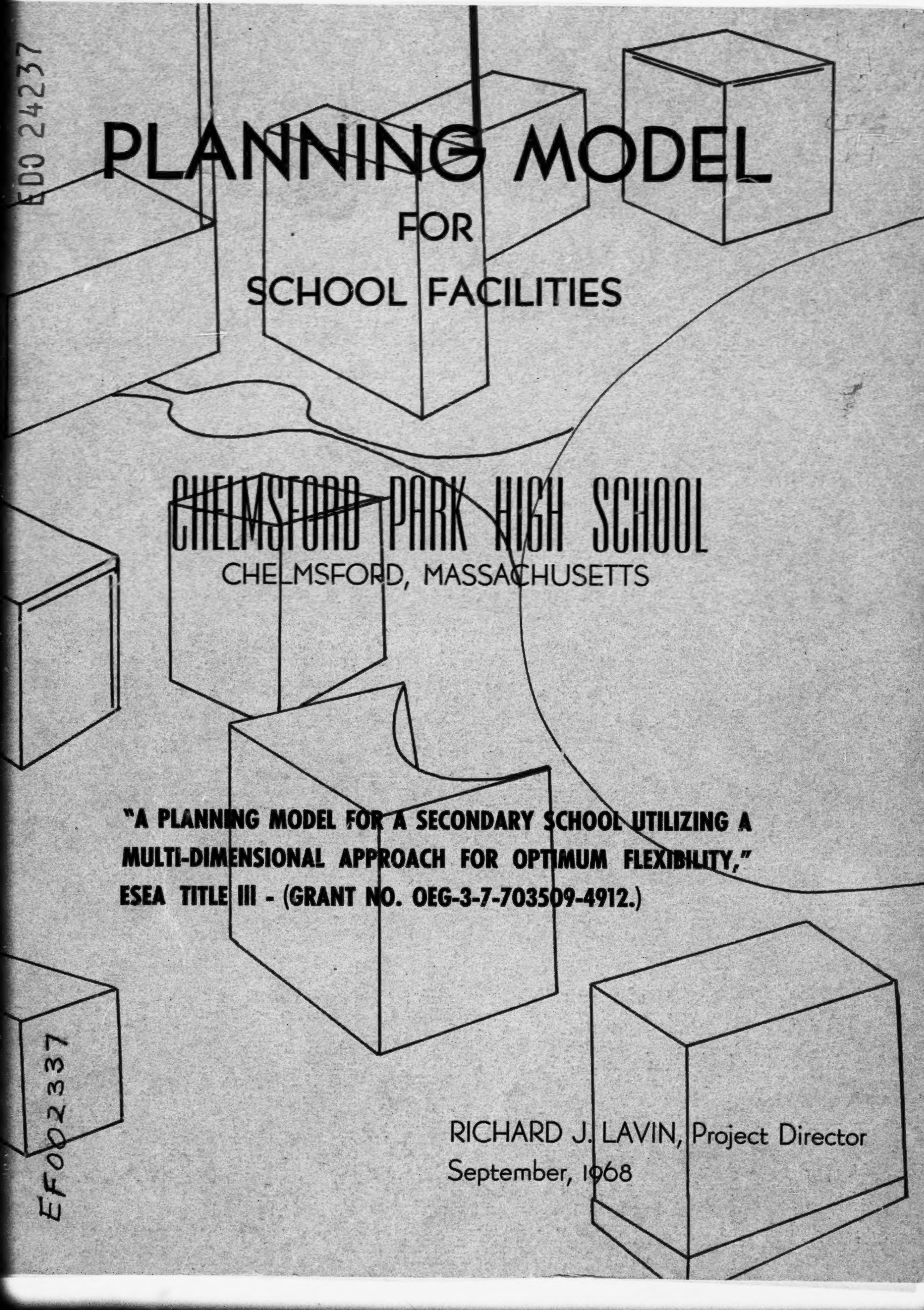

PLANNING MODEL
FOR
SCHOOL FACILITIES

CHELMSFORD PARK HIGH SCHOOL
CHELMSFORD, MASSACHUSETTS

"A PLANNING MODEL FOR A SECONDARY SCHOOL UTILIZING A MULTI-DIMENSIONAL APPROACH FOR OPTIMUM FLEXIBILITY," ESEA TITLE III - (GRANT NO. OEG-3-7-703509-4912.)

RICHARD J. LAVIN, Project Director
September, 1968

EF002337

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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SEPTEMBER, 1968.

CHELMSFORD SCHOOL COMMITTEE -

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- DR. EDWARD S. MARSHALL
- GERALD C. TUCKE
- GEORGE R. BIXBY, JR.

DR. THOMAS L. RIVARD, SUPERINTENDENT OF SCHOOLS

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RICHARD J. LAVIN, PROJECT DIRECTOR

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I

INTRODUCTION

INTRODUCTION

In September of 1967 the Chelmsford Public Schools were funded under the Elementary Secondary Education Act (ESEA) for a Title III innovative project.

The project entitled "A Planning Model for a Secondary School Utilizing a Multi-Dimensional Approach for Optimum Flexibility" received a planning grant for a one year period. The project was not eligible for continuation money as an operational grant due to the conditions of the original proposal.

In essence, this now suggests that the Chelmsford School Committee continue at the local level the planning process which has been provided impetus through the federal project.

There is no question as to the need for a new secondary school by 1972 as shown from survey data provided through the project. There is, however, the necessity to proceed with the planning for the new secondary school and the recommendations made within this report.

In this report is a section on the space needs for the new Chelmsford Secondary School. Should the current project have been extended into the operational stage these specifications would have been tested with the model in simulating various educational conditions. Meetings of this kind would serve also as in-service education programs in promoting communication and understanding of new tools, techniques and technologies.

The "physical model" developed in the project enables planners to improve considerations and assumptions in the planning of school facilities. It is the hope of the project that Chelmsford will find its continued use advantageous as it prepares for the year 1972 and its new school.

The cooperation of the Chelmsford School Committee, Superintendent of Schools - Dr. Thomas L. Rivard, the Chelmsford School Faculty, and the Chelmsford Education Advisory Committee is appreciated. The Title III Advisory Committee were consulted on various aspects of the study and their contributions have been appreciated. Responsibility for the Chelmsford Secondary School Planning Project and report rest with its Project Director - Richard J. Lavin.

II

BACKGROUND

BACKGROUND

Prologue

This report directs itself to the future needs of secondary school education in the Town of Chelmsford. Specifically, it attempts to provide useful information concerning one critical question: How best can the community in 1968 address itself to the problem of providing personal, intellectual, and relevant education for approximately 3000 students who in 1972 will be entering grades 9 through 12?

A Change in Philosophy

The idea that a school should be an educational community rather than merely a structure for shelter is not deep-rooted in American educational philosophy. But once accepting the premise that a school should be an academic way-of-life first, and a building second, then it must be determined what kind of educational community to create for the second half of the Twentieth Century.

When Americans begin to think about constructing anything -- be it a hotel, an airport, or a school -- our inclination is not to think initially of who and for what purpose the structure is being built; rather our tendency is to begin our planning with an estimate of building costs, and then accommodate our needs to a construction budget. In the area of education, i.e. school construction, academic needs even seem to take a backseat to physical aesthetics; Americans are terribly concerned about appearances, and the result has been a great many lovely schools that will be totally unsuited to the needs of students and teachers in the next few decades.

This is in no way meant to demean architects who must design the environments in which education and research take place; the best they can do is to reflect their own thinking (and they are not educators) and that of the community that is erecting a structure. Architects try desperately to drive their clients into a corner and oblige them to lay forth their specific needs, now and for the future. But more than likely the problem of creating the best in educational environments has not been thought through on the many levels necessary; in many cases it can't be since we are unable to predict finally what the state of education will be ten or twenty years from now.

Too often we find brand new schools unsuited for change; and, ironically, they house an activity -- education -- that is in a constant state of flux. The first point that should be made in a report such as this, is that the construction of a multi-million dollar school should be the result of the community's best possible thought, since concrete and steel are not very suitable mediums for the future changes that will be necessary if a community is to provide a continuingly effective environment for learning.

So it is with the kind of educational environment needed for the last half of the Twentieth Century that Chelmsford should first concern itself, designing only after this environment has been clearly defined a structure or a series of structures that will best house the specified environment.

New Environment for Learning

In defining an environment for Chelmsford's proposed high school, the project proceeded on the belief that a school should be an educational community, and we began with these fundamental questions: what kind of an academic community can best withstand the stresses and strains of mass education, enhance individualized instruction, and be personal enough to enable each student to develop on his own terms? What sort of school will enable teachers to be more than custodians of educational technology, but academic counselors, personal guides, facilitators and friends? Indeed, can a large school successfully hold off the forces of anonymous numbers which threaten to reduce the individual's satisfaction in personal achievement and growth?

Coupled with these questions about the kind of educational environment needed in 1972 are some basic 1968 assumptions that contribute to initial thinking. For example, one of the long held understandings in education is that each student is different. His ability, interests, and background are unique. Research has continued to emphasize these individual differences.

The real need in education is to recognize these many differences. But more important, any new school should provide an atmosphere and programs which are designed to instruct students in ways suited to their specific individual requirements. The quality of an educational program depends in great part upon how successful it is in the pursuit of individualization.

Recent studies have shown a wide variation of reasons why children do not learn as well as they should. These range from environmental factors (their own) such as lack of experience to specific physical handicaps such as brain damage and deafness. A school which intends to individualize instruction must be in a position to diagnose the needs and subsequently provide an appropriate program.

This approach requires special materials, teachers trained in the necessary advanced teaching techniques, as well as class sizes and facilities which permit the specialization of programs.

Gifted students need programs designed to challenge their talents. There is a need to encourage independent study and enrichment of the learning process.

The majority of students fall into the middle ability group and are usually treated as having similar needs and talents. We all know that this is not so. It is in this area that the least amount of individualization might produce the most exciting results.

The need in education is to throw away the many traditions and methods which really do not provide the desired results and in many cases actually hinder progress. No one advocates change without purpose, and this is the raison d'etre of this report.

It begins with Chelmsford's long-range educational needs in terms of quantity, i. e. numbers of students, etc., and it goes on to describe what we believe to be the most desirable environment in terms of educational quality.

Flexibility and Specialization

Unquestionably, Chelmsford, like all communities, must be prepared to provide a better environment for learning in the years ahead. This necessitates new and imaginative approaches to school design and educational programs, which together will allow teachers and students, as they grow in numbers, to interact at optimum levels. Costs are indeed important, but fiscal responsibility becomes a mockery when in the end a community satisfies a predetermined building budget, but does not satisfy the educational needs of its children.

In thinking about proper school design and learning environments, the word flexibility has taken on a new and profound significance. Today (and more so in 1972) teachers are being asked to respond not only to a greater number of students but to a greater variety of learning needs -- in the school, the single classroom, indeed in different individuals.

One of the most demanding questions facing educators today is how our schools -- existing or planned -- can be organized so that teachers can more effectively serve a growing number of students on a more personal basis.

In response to this challenge we are seeing, on an increasingly widespread basis, reorganization of the traditional compartmentalized order of classroom instruction, both in terms of subject matter and space.

One fact is evident: educational facilities planned for optimum effectiveness probably will not look like and will not be designed like the conventional classroom of the past. Classrooms were once (and many still are) simple enclosures of space containing students, teacher, blackboards, desks, and storage space. Changing educational methods, coupled with the uses of media, have changed not only the form of the classroom, but the way it functions.

The pace of this trend toward innovation increases as we discover the advantages of specialized instruction, as we learn more about the effectiveness of the teaching function in relation to the size of student groups, and as we find better ways to solve the complex problem of designing a school with students in mind rather than shaping student learning and flow to a structure.

Specifically, school design must change with an eye to better preparing students within content areas; it must change with emphasis on specialization, and it must have the built-in flexibility to allow for adaptation of specialized instruction. Lee, writing in "The Changing American School", says "We have noted something of the degree to which the entire school enterprise grows steadily more specialized. This relates both to subjects (e.g. French, Mathematics, Biology) and to professional functions (counseling, school administration, student personnel work), and as this situation has emerged, so necessarily has teaching or professional education become more specialized."

It is this movement toward specialization and its effect on the student that has, in turn, altered our thinking about traditional student groupings.

The imaginative use of space -- the manner and method in which students are grouped for differing instructional objectives -- is changing and will continue to change almost as rapidly as curricula, and as we learn more about how students learn. The interior environment of a school must also be able to change with it.

The conventional theory that medium-size classes are appropriate for all instructional situations is giving way to fruitful experimentation in the use of large and small student groupings. We have come to know that students can absorb and retain a great deal more instruction on their own, i.e. not in the traditional classroom setting. From this knowledge evolved the universally acknowledged concept of individualized instruction, and the beginnings of changes in conventional school design. For example, instructional materials centers with student stations called study carrels acted as the impetus in bringing about major modifications in library design.

Between the student studying alone at an individual instruction station and the student who is one of hundreds attending a lecture-demonstration in a large group room, there is the small student group which is highly suitable for instruction in the area of discussion. Again, unlike the conventional medium-size classroom, this situation offers more personalized teacher-student contact, and the increased opportunity for an interchange of communication between pupil and instructor.

These innovative student groupings, then, -- large group presentations, small group discussions, and independent learning -- have changed our thinking about the design of school plants, and are beginning to prompt unique and creative changes in space planning.

It is clear from all this that as the times continue to demand a greater emphasis on individualized instruction and, in turn, on creative flexibility in classroom design, educators must become more involved in working with architects to help create environments which meet individual learning needs of students -- be they bright, average, or slow.

Challanges and Communication

So if there is one thing that educators now seem to agree on it is that yesterday's school, so staticly designed, no longer suffices for today, or tomorrow. The rate of technological change and the development of new information is so great that teachers must have a facility that allows them to adapt methods of instruction to the changing times.

And the times call for adaptation of both curricula and teaching techniques; next week's scientific discovery can make last week's textbook obsolete. Change is also the password in the media field, and obsolescence is a constant factor. Equipment and new teaching and learning technology are undergoing continual modification and improvement; new kinds of equipment and new models of existing types are coming on the market daily. On the one hand educational administrators are understandably reluctant to invest in melange of new devices offered today when they may be obsolete tomorrow; yet the teaching staff feels somehow that the educational process and facilities for it cannot perform properly until adequately equipped.

This revolution in education is placing profound demands on administrators and teachers to think through their aims and goals and to relate them to new and needed educational environments, which in all likelihood will be quite unlike what they have been used to. They must stay abreast of and make decisions about the kind and quantity of information and knowledge that must be imparted; they must understand, react to, and analyze the trend toward increased specialization in teaching, both in terms of curriculum and the size of group instruction; they must relate all this to the dramatic changes in school planning and the need to consider classrooms equipped with a wide variety of new teaching and learning tools available to the creative school, including programmed instruction, closed circuit television, language laboratories, audio visual systems, and many more devices.

So curriculum ideas and artifacts are being projected on the stage of education in great profusion; but missing are patterns of organization for ideas and for ways of teaching that make these opportunities realistic or possible in a new classroom setting. It is here that system planning can show the relationships to goals and means.

The questions demand a totally new approach to school planning; and the concept of system planning and the use of a physical model is a means of at least first understanding the proper problems. One can begin with generalities, and should: how best can teachers organize and create new methods of instruction and combine them with emerging teaching devices and innovations in classroom design to achieve maximum results in terms of a variety of student learning needs? How can teachers facing growing numbers of students requiring larger and larger buildings personalize this type of education?

These questions point to more specific ones: As more visual images are used in instruction, for example, how is the student to read these with the same comprehension and the same retrievability now possible through print? Both the students and teacher must have a higher self-concept if they are to believe that inquiry and student generalizing are as relevant to learning as textbook memorization and note-taking from standard resources, and what kind of environment best enhances this self-concept?

And still deeper into inquiry one is pulled. If laboratory work, for example, is to result in effective investigation by the student, it must be more than the filling in of certain spaces in the lab manual or recording predetermined consequences. Individualized or creative expression must exist without standard norms and be accepted as divergent from that known or experienced by the teacher or the test maker.

Development stages of learning must be thoroughly researched as must physical development and process, thus, destroying old concepts of grade and requirements of the usual norms. The use of non-programmed and fugitive materials available from mass media requires that the teacher manage more diverse resources and information. As more and more content is organized through conceptual schemes, how is it to be evaluated, under what circumstances is it considered to be learned by the pupil, and what resources and facilities in a new school must be installed to insure this?

Answers to some of these questions are being sought throughout the country as the need for better educational resources becomes more critical, and as the rapid development of modern technology begins to offer opportunities for meeting the challenges of the knowledge and student explosions. It is the answers to these questions -- which are starting to come forth -- which have an important bearing on school design.

It is obvious now that the design of space for learning has not kept pace with the development of new instructional methods, and that our thinking about classrooms, for example, which still follow the typical pattern dictated by long-established convention, must change. Rather than standardization, more diversity and flexibility are needed -- new concepts that will enhance the positive trend toward individualized instruction, specialization among teachers, and the further division of students into both homogeneous and heterogeneous groups.

We must understand that a building, and the instruction that goes on inside it, are not independent of each other, and that the building must be made to complement the teacher, in a functional sense first and aesthetic sense second; that when designing a new school we are no longer merely buying shelter, rather we are buying an environment that is the best for learning.

This means that as never before all those responsible for building schools and the teachers and specialists in the use of instructional media must communicate better and, together, make a concerted effort toward suitable design. In short, design cannot be left exclusively to an architect, nor can the development of a new classroom, with all its new meaning and media, be left exclusively to the teacher. A planning team with a well-coordinated planning process in which architects and educators play key roles is needed.

The conclusions offered in this report are based on information generated by opening up new lines of communication between teachers, administrators, architects, and leaders of the community, who in their involvement in this project have translated specific interests in education into a group plan.

Through this study project they have begun a working relationship that better enables them to plan, carry out, and evaluate efforts aimed at developing a school worthy of the name in 1972.

Future Planning

The future will require ever-increasing communication as the boundless education process continues to change. Just as administrators, architects, and those developing new media must consistently attempt to understand fully the teacher's diverse problems, teachers will need sustained guidance in understanding newly-created and unconventional teaching tools, methods, and space innovations. Neither can do the job without the help of the other; the age of the generalist is over. Ever since Joseph Henry, who discovered the electromagnet, handed over to Samuel F. B. Morse the problem of adapting it to the telegraph, specialization in all disciplines has increasingly necessitated the need for concerted communication and action. With it, there can be the beginnings of imaginative and fruitful school planning; without it there can be only wasted resources.

A Final Word About Planning

In today's swiftly changing world, the ancient axiom of "plan ahead" has taken on a new significance. The growing student population, the increase in the amount and sophistication of knowledge that must be learned, and the rapid development of new teaching and learning materials and tools demand an increasingly precise capability both to predict and satisfy long-term educational objectives.

The planning function -- which is the sole reason for this study -- at its best does not provide answers, rather it offers choices. With it we can, like Frost, reflect with some clarity on "The Road Not Taken"; with it we can better judge the road to take. It is important that we select the right road for at stake is more than a building; it is a school, and the school is the best opportunity that society has to shape itself for the future.

III

CHELMSFORD SCHOOL SURVEY

CHELMSFORD SCHOOL SURVEY

Initially in the project, steps were taken to examine Chelmsford's rapid growth and its bearing upon total school needs. It was readily recognized that the size and organization of a secondary school could only be determined following a total review of the school needs.

Dr. John Marshall, educational consultant from Belmont, Massachusetts, was engaged by the project to undertake a background study of future school requirements for Chelmsford.

This phase of the project was an in-depth study and is made available as a separate printed report.

Data in this study includes information from the Chelmsford school system regarding the following:

1. Enrollment projections
2. School building appraisal
3. Review of school organizational patterns
4. Long-range plan recommendations

IV

MODEL DEVELOPMENT - RATIONALE

MODEL DEVELOPMENT

The enormously complex problem of bringing together and coordinating the ideas and needs of all people involved in planning a new school can now to a large extent be aided by a unique use of simulation techniques.

Early results of our Title III project indicate that architects, administrators, teachers, school committeemen and consultants should all simultaneously participate in designing both a new physical plan and compatible curriculum.

This is accomplished without the rhetoric gap traditionally encountered among members of planning teams, by employing a physical model with movable elements of a proposed school plan.

Under the Title III planning grant, which is called "A Planning Model for a Secondary School Utilizing a Multi-Dimensional Approach for Optimum Flexibility", we are specifically attempting to design a 3000 pupil secondary school for Chelmsford, Massachusetts. The new school must be flexible enough to expand to a 4000 student capacity.

In a search for new ideas and ways to identify how effective dialogue could be introduced into the planning process it quickly became apparent that some form of visual aid was required in the very early stages of planning. We chose a scaled model incorporating most of the elements found in a school environment.

By observing the physical model, planners are able to comprehend more quickly and relate the number of variables present in curriculum change, new course structure or the design of a building to house instructional programs.

Because the elements incorporated in the model are movable, planners can change or modify the simulated program to meet specific requirements.

Simulation of conditions in a complete instructional system before construction is proving to be an invaluable aid in determining optimum design requirements.

While simulation is not new - this is one of the first experiences in directing it toward school planning.

Initially we developed a model which represented physical space. Then working with various teacher groups, students and administrators, we began adding symbols representing equipment and people. Finally specific information peculiar to the Chelmsford project was added.

The physical model is the key element which provides educators and planners the opportunity to conceptualize their views of the instructional system.

In the Chelmsford project a large magnetized game board with movable building elements has been constructed. Small markers are used to represent students, teachers, administrators, equipment, etc.

In its simplest form users of the model:

-- allocate space
-- determine the deployment of professional and non-professional staff
-- examine the process of programming or developing curriculum
-- plan student activity schedules (commonly called program of studies)

Seemingly sound alternatives are tested for sensitivity to change in an assumed environment. Much valuable insight has already been gained by devising alternative solutions to various static situations.

Virtually all the problems encountered in designing a multi-house educational center are being evaluated. How do you provide enough different kinds of spaces to meet changing requirements? Requirements which range from different size classes and different equipment needs to a variety of teaching methods. Would a series of moderate size classrooms suffice -- should half of the rooms be small and the other half large? What about movable walls? Special equipment needs for science? Should the science buildings be located separately?

Is it beneficial to have science houses and liberal arts facilities interwoven? Do cost considerations demand that certain houses be located at certain locations? What will future needs be -- can cafeterias double as study or conversation areas and can they be somehow woven into the liberal arts science pattern?

The physical representation of the system provided by the model allows the planners the opportunity to keep each of these and more needs in front of them while at the same time providing an overall or big picture view.

Planners can visually relate elements, discuss them, and use the model as a visual aid in communicating with other planners. Compromises and trade-offs can be made.

In the course of allocating space, teachers, students, materials and other resources to execute alternative systems, planners:

-- determine the need for additional resources and some estimate of what the actual requirements will be

-- judge different specifications of various planners in terms of real life situations

-- introduce compromises to make alternatives workable. The result is the adjustment of the alternative to meet system constraints- some of which would not have been anticipated before the activities. When adjustments cannot be made or are unacceptable then the alternative is rejected.

-- provide an estimate of the value of an alternative based on its introduction into the systems.

-- solve problems as they arise.

The educational planning for school facilities is a process. In the Chelmsford Secondary School Project "A Planning Model for a Secondary School Utilizing a Multi-Dimensional Approach for Optimum Flexibility" the approach has been one of process rather than product.

A document prepared such as educational specifications can only provide limited assistance in the planning of schools. This fact became more evident as problems in communication developed regarding philosophy, objectives, goals and their definitions.

A study in 1965 - "Tomorrow Schools Today" by Robert Shannon, found in a visit across the country: "Educational leaders continue to encourage construction of spaces for education that get in the way of the very functions they are designed to serve.

Teachers and architects do not get involved in thinking through requirements for educational structures. Lay citizens are not educated to see needed transitions in construction of learning spaces. Educators seldom recognize the qualities essential in a good physical plant for education. Architects design exciting exteriors but poor interiors because they don't understand what is going on in the spaces they create.

Administrators short circuit planning and fail to find answers to fundamental questions before construction.

These above problems are not unique to any school system but apply here in Chelmsford as they apply in other parts of the country.

How does a model assist in improving quality in the planning of schools?

a. People must be involved in the process .

b. The absolute point of departure must be purpose .

c. What activities are necessary to achieve purpose ?

d. What spatial qualities will contribute most to these activities ?

e. Educational Specifications must be provocative and communicative .

f. There must be continued evaluation of goals .

The development of the model has taken place in the project only after the above considerations. The Chelmsford Secondary School Planning Project unfortunately has only been a planning project and not an operational program. Although the model has now been developed its application has not been nor will it receive proper testing through extension of this federal project. However, the model has been physically developed and is described as follows:

Inventory of parts - Physical Model

Base-board - 1 reg'd

Carry-box - 1 reg'd

Pieces

1. Professional staff symbols:
    - Teachers - 30 reg'd
    - Councilors - 5 reg'd
    - Librarians - 4
    - Health personnel - 3
    - Audio-visual - 3
    - Administrators - 5
    - Unassigned - 10

2. Para-professional staff symbols:
Teacher assistants - 20
Librarian assistants - 5
Health assistants - 2
Audio-visual assistants - 8
Administrative assistants - 5
Unassigned - 10

3. Equipment symbols:
Dial access equipment - 15 reg'd
Motion picture projector - 5
Slide projector - 25
Overhead projector - 25
Business equipment - 10
Unassigned - 4

4. Student symbols: (each piece = 6 students)
Fast students (yellow) - 30 reg'd
Average students (white) - 30
Slow students (blue) - 30

5. Arrows:
White - 4 reg'd
Yellow - 4
Blue - 4
Green - 4
Red - 4

6. Running track - 1

7. Swimming pool - 1

8. Furniture:
Carrels - 10 reg'd
Tables 5' long - 10
Tables 10' long - 10
Tables 15' long - 10

9. Walls and partitions:

Type Length	15'	20'	25'	30'	35'	40'	Total
Normal	12	12	12	12	12	12	72
Glass	2	2	6	6	6	-	22
Folding	2	4	4	4	-	-	14
Storage	8	8	8	8	-	-	32
Special Equip.	4	4	4	4	-	-	16
Special use	4	4	4	4	-	-	16
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Description of parts - Physical Model

Base-board

Rigid panel 24" x 36" x $\frac{1}{2}$"

Sheet steel working surface
Gray color
1" x 1" grid superimposed on gray field.

Carry-box

Wood box 13" x 22$\frac{1}{4}$" x 1-3/4" over all.

Bottom compartment sub-divided to receive 3-dimensional pieces.

Cover fitted with sheet steel lining to hold flat symbols.

Pieces

1. Professional Staff Symbols:

   3/4" O.D. x 1/16" thick magnetic discs
   Red color
   Black identification letters as follows:
   Teacher - T
   Councilor - C
   Librarian - L
   Health personnel - H
   Audio visual " - Av
   Administrator - A

2. Para-professional Symbols:

   3/4" O.D. x 1/16" thick magnetic discs
   Orange color
   Black identification letters as follows:
   Teacher assistant - TA
   Librarian " - LA
   Health " - HA
   Audio visual " - AVA
   Administrative " - AA

3. Equipment Symbols:

   1/2" x 1/2" x 1/16" thick magnetic squares
   Green color
   Black identification letters as follows:
   Dial access equipment - DA
   Motion picture projector - MP
   Slide projector - SP
   Overhead projector - OP
   Business equipment - BE

4. Student Symbols:

1/2" O.D. x 1/16" thick magnetic discs.
Color code as follows:

Fast students -	Yellow
Average students-	White
Slow students -	Blue

5. Arrows:

1½" long x 1/16" thick magnetic arrows.
Colors: White, yellow, blue, green and red

6. Running track:

Transparent oval 19½" x 10" x 1/16" thick.
Black, ½" wide running surface painted at periphery of oval.

7. Swimming pool:

9½" x 4½" x 1/16" thick rectangle
Black pool 3" x 6" centered in rectangle
White apron covers balance of rectangle.

8. Furniture:

Carrels - 3/4" x 3/4" x 1/2" high cruciform.
White color
Mounted on 1/16" thick magnetic base.

Tables - 1/4" wide x 3/16" high x 1/2" or 1" or 1½" long.
White color
Mounted on 1/16" thick magnetic base.

9. Walls and partitions:

Normal wall: 3/16" wide x 15/16" high x various lengths
White color
Mounted on 1/16" thick magnetic base.

Glass wall: 3/16" wide x 15/16" high x various lengths
Transparent
Mounted on 1/16" thick magnetic base.

Folding partition: 3/16" wide x 15/16" high x various lengths
Corrugated surfaces
Red color
Mounted on 1/16" thick magnetic base.

Storage walls:	3/8" wide x 15/16" high x various lengths White color Mounted on 1/16" thick magnetic base.
Special equipment walls:	3/8" wide x 15/16" high x various lengths Black color Mounted on 1/16" thick magnetic base.
Special use walls:	3/8" wide x 15/16" high x various lengths 3/16" deep x 7/16" high slot milled in one face of wall Black color Mounted on 1/16" thick magnetic base.

MODEL IN USE

V

EDUCATIONAL SPECIFICATIONS

INTRODUCTION

The following educational specifications relate to the kinds of programs, activities, and facilities that appear applicable for a Chelmsford high school of 3000 students. Some of the programs, activities, and facilities are dealt with rather briefly - others in considerable detail.

The specifications are based upon two major concepts: (1) that of large-group instruction, small-group discussion and work, and independent and directed study; (2) that of integration of curriculum so that each program works in concert with the others on an equal basis to provide the students the best possible educational experiences for the best possible learning.

In Chelmsford the secondary school population will be sufficient in size to consider a complex of facilities as one park-type high school. "Park" in this context refers to the horizontal grouping of secondary school grades in one facility or group of buildings. Much attention has been focused on the emerging concept of "Educational Park" but with basically the same reasons that were applicable to the rural consolidated school.

The major concern in the planning of large park-type schools is that the overall size tends to contribute to impersonalization of space and to the anonymity of the student.

How can we provide an education that is at once highly personal, highly intellectual and extremely relevant to life in today's world? The student needs an education personal enough to enable him to develop on his own terms, to inquire into things that excite him as an individual, to develop his aptitudes, and to strengthen his weaknesses. The organization of the large school requires softer, more personal concentration through the creation of such systems as schools within schools, program centers and/or specially designed units within the school.

To develop on his own terms, follow his special interests, enlarge his particular talents and nurture his uniqueness, the student needs the teacher to function as his "academic counselor", his personal guide, facilitator and friend.

To develop basic knowledge and skills, such as learning to use language and number skills, and to acquire disciplines, the student requires individualized instruction. His program should be geared as much as possible to his rate of achievement, his learning style and his strengths and weaknesses.

To become an efficient member of an inquiring group that tracks down information, checks out hypotheses, debates social issues, "practices" the scholarly disciplines, tries out old and new ideas requires that a student have teachers who lead an inquiring group and help it become a self-propelling miniature democracy whose members improve their interpersonal development in the course of their academic inquiry.

The means for developing a school system or facility that will foster these concepts is coming within our grasp. The buildings on the Chelmsford secondary school complex require the best innovative and creative administrative and architectural talent available. This talent is challenged not to provide the ultimate system but rather to make provisions in a facility that will enable the system to adapt to changing requirements. Advancing technology and new understandings are contributing to the feasibility of making it possible to prescribe for each student the learning materials and teaching strategies which closely match his achievements, ability and learning patterns.

Education in the new Chelmsford secondary school will not be limited to normal every day enrollment of students. More school systems each year are extending their school day and extending their programs into the summer months. The summer remedial, avocational, recreational, enrichment type program answers a great many of the needs of school systems. It lends itself to maximum flexibility and adaptation of local needs and provides for many enrichment activities which cannot reasonably be included in the regular school session. Opportunity is provided, too, for adult planning and participation in the school program and for extended adult activities. The current trend of providing education for people of all ages will require study as to the range of programs needed. The school will serve as the educational center for the community. In this sense it must be more than a compulsory attendance unit and become truly a "shopping center for education" where it invites total community participation.

The knowledge explosion is being accompanied by technologies which will enable an entire publication to be recorded on three tiny pieces of microfilm. The implications of such technologies on school facilities will require the capability of moving into the use of these materials as this technology develops to the point of practicality and educators become ready for its use.

The educational program, the staffing, the curriculum and the organizational arrangements necessary in a new secondary school facility are impossible to annotate in any set of educational specifications. However, in the planning phases it is possible to begin communication which includes the people who will use facilities or at least some in-service education on the use of such facilities.

With the above as guidelines, the following are listed considerations for the educational requirements of a new secondary school facility:

A. Organizational arrangements

The arrangements necessary for students to have identity suggests a house arrangement where 600 students will be based. Not all of the education will go on in these instructional centers. Specialized areas because of equipment space or activities will be established in separate centers which will serve the total secondary school population. These special centers will provide for recreation and physical education, arts, sciences, and central library facilities. Instructional houses will include provisions for food services, resource and media centers, staff offices, and student activities. Most of the academic and social life of the student will be in the houses. Each unit or house will have an administrative head who is partly autonomous in operation.

b. Instructional houses

Instructional centers will not provide for a series of classrooms, but offer different kinds of spaces for the many activities of discussions, independent study, lecture, laboratory and resource spaces. Groups might be arranged in segments of 6, 12, 24, 48, 96, and 192 depending upon the program requirements.

Instructional houses will include the following:

1. A well-equipped learning center acting as a branch of the central library. (Media center will be adjacent but separate from the learning center.) The facility will have independent study spaces and small group spaces.

2. Academic space will be arranged in combinations of large, medium and small but easily rearranged or scheduled as program demands change.
3. A common room will provide both as a dining area and furnished with tables and chairs for study purposes. These areas will be close to locker areas and represent the social area of the center. Kitchens will be adjacent but separate. Snack bars might also be available.
4. Administrative and teacher space will be available in the house.
5. Lecture halls in the academic spaces may be so designed as to provide for dramatics, musical or audio-visual use.

C. Media systems

Classrooms will be designed for the use of media and as a result may not resemble the conventional classrooms of the past. Each house will have communication centers which will provide the space for television and also electronic reproducing equipment which can reproduce tapes, slides, strip films, video tapes, program learning materials -- anything that is now in use. It will serve as a dissemination center for all activities in the the house and perform as a software development center for teams of teachers or individual teachers working on curriculum. It will coordinate and plan intricate programming for various combinations of hardware -- software systems. Classrooms will be located in such a manner as to allow programming to be set up so as not to interfere with classroom use. Rooms must be adaptive to different and new kinds of projection equipment without necessitating remodelling of rooms. These centers may conceivably become project centers for needed research. Programs in research might be involved in subject matter or skills analysis to determine the content of units of instruction, what to teach, when and in what sequence, to whom:

D. Staffing implications

Educators are now much more concerned with teaching youngsters to become effective learners than with trying to teach them mastery of a fixed amount of subject matter. The roles and functions of teachers and administrators are changing as the various aspects of planning, curriculum development, counselling, research and in-service education are identified. Economy and necessity are recommending that differentiated school staff include an expanded non-teaching category of classified personnel.

Inherent therefore in a new facility is the necessity of providing spaces for the roles and functions that will be evident in new kinds of staffing. Spaces will consider the needs for conferences, work rooms, material development, counselling, resource centers and staff offices.

E. Central facilities

These will include central administrative and guidance, library resource center and central service functions needed for the various houses.

F. Specialized areas

Program centers for the sciences, arts, physical education and recreation functions will be provided as separate facilities because of the different kinds of equipment, acoustics, laboratories and workshops. Specialized libraries and resource centers will be included.

SPACE DESCRIPTIONS

Outline

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ACADEMIC CLASSROOMS

The planning of academic classrooms is becoming increasingly complex.

As instructional attention becomes more closely focused upon making the student a self-directed learner rather than a storehouse of facts that are soon forgotten or, if remembered, obsolete, the learning-teaching activities and their spatial requirements become increasingly dynamic and varied.

As teachers become more behaviorally oriented toward the recognition and treatment of individual student differences, not only academic differences but also those of social and psychological development, their behavior and the activities they sponsor change. Some trends in these directions are as follows:

1. Team teaching has been instituted to make maximum utilization of staff resources as well as of student time. Large-group instruction, small-group work and discussion, and independent study stem from team teaching.
2. Individual study carrels have been recommended in greater and greater numbers to sponsor and facilitate independent study. At the same time, critics are beginning to question their appropriateness as students appear to favor small-group interaction for learning. They do not utilize the individual study carrels even for reading because of the isolation imposed by them. The need for carrels to accommodate noise producing equipment can be questioned when tables and wall benches with earphone jacks can permit independent study without isolation

and, at the same time, provide greater utilization and flexibility of existing space at less cost.

In the light of new concepts in teaching and the use of new technology, academic instructional areas should be developed to provide for small groups of 3-5 and 10-12, and larger groups of 35-45 and 60-120. A decision will have to be made in each school and perhaps by each teacher as to how large a group becomes before it is classified as a large group and is moved to the large-group instruction area. The building design should be such that combining small areas into larger ones will provide acceptable instructional areas or that dividing large areas into smaller areas also will provide functional instructional spaces.

Although the instructional spaces for specific subjects such as English, social studies, and the like, should be together in any one house or school, they should be as nearly adjacent to one another as possible in order to encourage cooperation, communication, and understanding among the staff toward the realization of a more closely integrated curriculum. Such an arrangement also provides more complete utilization of facilities.

A resource center should be an integral part of each of the instructional houses and the science unit. The size of the house and the effectiveness of these centers may dictate the need for others in other departments in the main media center or in those now sharing one with another. The center would be an extension of the library or instructional materials center and have written materials, tapes, film strips, films, loop films, etc., appropriate for current instructional and learning needs in that department. At a higher level of sophistication, dial access systems could permit and encourage direct communication with the

IMC and its resources without requiring the student or teachers to leave the resource center.

The resource center generally is planned to provide for different types of activities: independent study in carrels, small-group work around tables; both individual and group viewing of films, filmstrips, and the like, individual reading, and lunch.

The number of students to be accommodated in the resource center depends upon the extent to which teachers will free their students for independent study or directed study, the accessibility of the center to instructional areas, the quality and quantity of materials made available, and the quality of supervision and assistance provided the students who use the center.

Recommendations are made that 60 per cent of a student's time be spent in independent study. Although the move toward nongraded programs tends to make this figure more acceptable than only several years ago, providing for 30 per cent of the students in the resource center would appear to be more realistic. More than this number or the excess could be cared for in the main media center. With from 30-50 per cent of the students leaving the instructional area, there should be room there for further independent studying students.

Language facilities

Language facilities should follow the same general specifications as those for academic instructional areas. It is proposed that there not be provided a laboratory per se but rather that classrooms be equipped with listening stations with a variety of electronic aids located around the perimeter of the room. These rooms would be included as scheduled instructional space.

Speech and drama

A speech and drama area should be provided to accommodate 20-25 students. It should include a stage as well as storage room for flats, storage room for props, stage curtains, backdrops with permanent outdoor scenes, an area for building sets, an area with sewing machines for costuming, and dressing rooms, one for girls, one for boys. Each of the dressing rooms should have a restroom, cabinet space for makeup, and a closet with hanger space for costumes.

A projection booth and screen are desirable.

Lighting requirements would include stage, overhead, foot, and spot lights; also a dimmer panel.

The varied activities of this area pose problems as to its location in relation to other instructional areas. Despite its immediate identification with english and even social studies, the activities dealing with building sets and making costumes suggest that it is part of a fine and applied arts center that would include the arts, homemaking, and industrial arts

Adjacent to the speech and drama area should be a theater that could be used as a large-group instruction facility. Despite what may appear to be a logical decision to combine the speech and drama area stage as part of the little theater-large-group instruction facility, such combinations almost always prove to be disfunctional, limiting rather than expanding educational activities.

ADMINISTRATION & GUIDANCE, TEACHERS, HEALTH

A new school presents an opportunity to break from tradition that other schools do not. If a new school cannot represent newness in other than the building, it is questionable if it ever can.

The principal's office and those of his assistants should be close to those of the teachers or at least close to their production center or lounge in order to facilitate communication and understanding.

Guidance personnel should be distributed in the various houses and the central core facilities in order to be close to the students they serve. The old argument that they have to be close to the administrative offices because of the accessibility of records no longer obtains as the computers can print as many copies as are necessary at minimal cost. With thermofax and other immediate copying machines on the market, accessibility of records should be no great problem as compared with the increased communication and understanding of students to be realized by being where they are.

Teachers should have office space with a conference area in each of the instructional areas. They should not be attached nor adjacent to the resource centers because of the danger of inhibiting students in the center. Likewise, students may inhibit teachers with their nearness. Some attempt should be made to have all the teachers' offices as close together as a means for increasing communication among departments and different grade level teachers. A better suggestion would be for the administrators to plan free time for this purpose - a series of meaningful experiences in working together for the common good of the students.

Health service units are rather traditional, with a nurse's consultation room in the middle and a boys' rest area and toilet on one side, a girls' on the other. It is suggested that this unit be made part of the home economics complex with the nurse assisting in the home economics program, becoming a teacher in her own right.

ARTS AND CRAFTS

Spaces

Laboratories including storage area necessary to accommodate a student body of 3000 students, a percentage participating in an art laboratory, a percentage in a humanities or art history class, a percentage in both during their four years.

One lecture room for art history or humanities and for use when group is doing figure drawing and similar work. (Chairs or desks on several levels)

Two laboratories for metals, sculpture, etc., with the equipment such as compressors, rotary press, and grinder that will be used by both fine and industrial art classes. (This is needed as a possible combination industrial arts and arts laboratory, since it will not be used constantly by either group. Photography laboratory might also be included here. A dark room will be needed.) A minimum of three art teachers is needed for a high school of this size.

Special considerations

Art laboratories should be located near industrial art laboratories, auditorium, and protected from general instructional areas so that noise from this department does not distract others.

North light is preferred in laboratory rooms. Lighting should be indirect or diagonal to eliminate shadows cast on papers or work.

- Hot water is essential to each art laboratory.
- Steel molding for display in front of lobby or library
- Each laboratory must have an outside door opening onto a patio for working out of doors, for outdoor displays, and for large work such as

sets and decorations.

- A vented kiln room for ceramics work is needed.
- An intercom between art rooms could be an asset to members of the department.

Spaces and equipment

General

Two general art laboratories with identical equipment and facilities. Each is to accommodate twenty-four pupils and provision must be made for different work stations for each individual within this laboratory, such as is done in home economics laboratories. Space must be provided between these two laboratories for a combination locked storage and teachers' work room and for a kiln room. The latter must be vented and also house drying shelves for ceramic and clay sculpture. These laboratories must have running water, both hot and cold, and need north light. The space required is at least a double classroom size for each laboratory, with the space required for the locked storage and kiln room in addition to that allotted for the laboratories. There is an outside patio for these laboratories.

The two dimential lecture laboratory is to be used by art classes only and is not a room provided for humanities. This laboratory is to be a regular-sized classroom with a "terraced" or split-level floor; is to have facilities provided for showing films; and is to be used for such two-dimensional work as figure drawing, portraits, and flat, clean work that needs to be done away from the area in which clay, paint and inks are being used. A locked storage and teachers' work room combination and an audio-visual library room are needs that should be considered. It is suggested that this and the metals-graphics laboratory be situated across the corridor from the general arts laboratories, and that the metals-graphics laboratory also be accessible to the industrial arts laboratory.

A metals-graphics laboratory is needed if a school of this type is to have the facilities necessary to a good fine arts, graphics arts and industrial arts program. This laboratory should be classroom size and must be equipped with the special needs of metals and graphics such as gas outlets, acid-resistant sinks, and compressor, a rotary press and a dark room. This room should not have a class assigned to it, but rather should be available for use by the classes studying these techniques. Eventually, if not initially, a class in printing or silk-screening should be added to the program.

Specific

Two general art laboratories

An area of at least 27 x 80 feet is needed, with north light for each. Windows should be placed along the north wall, and transoms located above counters and display area on south wall.

Floors in laboratories should be linoleum tile in the section to be used for painting and design, and either ceramic or terrazzo tile in the ceramic, sculpture and industrial design area.

Open storage and student-project storage space must be provided in each general art laboratory. These areas should be located on each side of the locked storage and teachers' work room that is to be situated between the two laboratories.

Each laboratory should have a "wider-than-standard" door leading outside, another door into the corridor, and a third door into the teachers' work room and kiln room.

Patio outside art laboratories. The patio should have a concrete floor area of 40 feet, with a translucent, corrugated fibre glass covering extending approximately 20 feet out from the building over the center of the patio. To be functional during the whole year, the patio area could be an adaptation of a "loft" area designed for winter use, with heat.

Teachers' work room with kiln room

A combination locked storage and teachers' work room and kiln room should be placed between the two, large, general art laboratories. The kiln room must be vented and should have drying racks for clay. A narrow hallway with a possible display case opening out into the outside corridor should run between the two laboratories and in front of the door leading to the teachers' work room and kiln room.

Two-dimensional and lecture laboratory combination

This room is to be standard classroom size, but is to have the floor on several levels. It is suggested that the highest level be located at the outside wall on the south side of the room, with teacher station near the wall on the corridor side of the room. One door is needed from corridor, and a second door should be provided that leads into the audio-visual library room located between this laboratory and metals-graphics laboratory.

Audio-visual - library room and teachers' work room

A room is needed in which to store and care for art books, magazines, art reproduction files, audio-visual equipment, and for possible use as a reading room or resource center. In this same area another teachers' work room and locked storage room is needed for materials and supplies for the metals-graphics laboratory. This storage room could be smaller than the one across the corridor for the two large laboratories. (A door is needed between the storage and audio-visual rooms.)

Metals-graphics laboratory

This room is an essential need of the total art program. A standard-classroom size would be adequate if special needs are provided for. This section must have a dark room, two sinks, gas outlets, and other needs listed under an equipment list. There should be one door leading into the corridor and a second door leading into the storage and teachers' work room (No door into audio-visual-library room)

AUDITORIUM

(Large group instruction)

(Little theater)

A large auditorium generally cannot be justified educationally because of the infrequency of use. Large assemblies may be held in the gymnasium albeit conditions there would not be the most favorable. It appears paradoxical to speak of treating of individual differences and at the same time sponsoring total school assemblies that can be equally appealing and instructional for 9th, 10th, 11th, and 12th grade students.

In lieu of an auditorium, it is recommended that a little theater be constructed seating 300 to 600. In a school of 3000 students, two theaters may be advisable.

A minimum of one large-group instruction area should be provided for each of the instructional houses. Depending upon one's perception of the size of a large group, each such area should seat from 90 to 150 students. A common arrangement has been to build a large-group instruction area to seat 200 to 300 students and have a movable partition capable of dividing it into two independent areas. The shape of total area and of the two areas created by the partition as well as the quality of the partition for deadening sound that tends to be transmitted from one area to the other determine the effectiveness of such an arrangement. Each large-group area is primarily a media center with all types of equipment from a slide projector to a TV camera response systems available for presentation of materials and gathering information. As stated in referring to the large-group area for science, such a facility lends itself admirably to demonstrations, particularly when used in conjunction with TV cameras and monitors. The planning of a large-group instruction area is largely the responsibility of an expert in media presentation. As in purchasing an automobile, it can be as simple as a person wants or as complicated. Only an expert is sufficiently up-to-date to advise reliably.

ADULT EDUCATION

In keeping with the growing acceptance by the public that education is a life-time pursuit rather than an 8, 12, 16, or 20 year formal program, the fastest growing segment of education today is that of adult education. In many schools the number of adults attending night classes exceeds the number of young people attending the schools during the day.

The second largest increase in school attendance beyond high school is represented by the growth of the community colleges.

Both the growth of adult education enrollments and those of the community colleges must be given increased consideration in the planning of new buildings for high schools. In the first instance, the buildings must be planned to care for adult education needs but, even more important, to make facilities accessible to adult classes on a selected basis without having to make all accessible while providing access to a few. Security and control become important considerations as those in control of adult education programs seldom are those in control of the day programs.

The growth of community colleges must affect the programs of the high school much the same the programs of the elementary and junior high schools affect the high school curriculum. In too many instances there is little if any communication in a functional sense between high school personnel and those of the community colleges just as there is little between high school personnel and those of the 4-year colleges.

COMMERCIAL EDUCATION

Business education spaces should be located in each of the instructional houses to serve such programs as typing, bookkeeping, office practice, business machines, distributive education and data processing. Typing space should be capable of providing large-group scheduling for both business and personal needs. Only the specialized rooms need be set aside for the commercial subjects; other courses such as consumer economics can go on in regular classrooms. Where limited student scheduled time combines with high equipment purchase duplication of such facilities in the various houses should be limited. A distributive education room might be located in one instructional house or moved from house to house during the year.

Typewriting

Objectives

Vocational competency - prepare for employment
Personal use - personal communication

Classroom activities

1. Class discussion in which all members will participate
2. Class demonstrations - using the following:
    - Chalkboard
    - Wall charts
    - Exhibits on tackboard
    - Flannel board
    - Demonstration from teacher demonstration stand
3. Individual work - most of the class time will be spent in this type of activity
4. Committee work. Facilities should be provided which will permit small groups to work on newspapers, etc.
5. Observing films and filmstrips
6. Teaching of key-punch should be considered when purchasing equipment.

Bookkeeping

Objectives

General - The bookkeeping course is designed to contribute an understanding of our economic system with special emphasis on how business is organized, how it is operated, what forms and papers are needed to record and control its activities, and of what importance records are to management decisions.
Specific - Bookkeeping is to improve the technical competency of those students who will seek business employment in the field of bookkeeping and accounting or as a member of the accounting staff in business.

Classroom activities

1. Class discussion - Class discussions will be held in which all members of the class will participate.
2. Class demonstrations - Demonstrations will require the use of:
    a. Chalkboard
    b. Flannel board
    c. Wall charts
    d. Exhibits on tackboard
    e. Projector, attached to the teacher desk
3. Individual work - Students will need to have available work surfaces for their textbooks, workbooks, and working papers for their individual work. A relatively large working surface is required. Teacher access to every student's desk must be available. One chair for each student.
4. Committee work - Committees composed of two or more students will be organized. These committees will work independently of the other members of the class.
5. Using adding machines and/or calculators - One machine for each two students. As bookkeeping involves the addition and subtraction of columns of figures, students should have access to adding machines and/or calculators to perform these calculations.
6. Typewriting reports - Students may be required to submit certain bookkeeping work, such as financial statements and reports, in typewritten form. Students should have access to typewriters.
7. Individual work area for teacher with desk, typewriter, file cabinet and lavatory.

Office Practice

Objectives

1. General: To aid the student in the development of understanding fundamental activities of an office and the maintenance of appropriate records and/or communications necessary to accomplish efficient business administration practices.
2. Specific: Office Practice should provide training in basic machines and filing procedures, familiarization with equipment

upkeep and supply sources, and should correlate the skills and knowledge previously learned in other business courses, especially typewriting.

3. Personality: To aid the student to develop the ability to work harmoniously with others, follow directions accurately, and to "follow through" with project work of a realistic nature.

Classroom activities

1. Machine familiarization and a moderate, employable cometency skill:
   a. Secretarial machines for transcribing dictation from both record-type, belt-type, and erasable tape-type transcribers, into mailable copy.
   b. Duplicating machines, both spirit process and ink reproduction. Preparation of masters and actual completion of duplication. (Preparation of masters for offset printing also)
   c. Calculating machines - key-driven calculator, rotary calculator, adding-listing machine, full-visible adding machine, and printing calculator.
   d. Computers and the secretarial tasks associated with them. This is becoming a major field of study for vocational education. The extent to which this can become a major field of study in the comprehensive high school depends upon the availability of machines in the school or neighborhood industry, student interest, etc. It should receive no less attention in the total program than any of the other areas - a. - c., above.
   e. Innovations in the machine area, such as the dial-by-punched-card on the telephone. The quality of the total program in commercial subjects is dependent to a great extent upon the ability to keep up-to-date with current business and machine practices.

2. Filing rules and procedures: introduction to the four basic systems - alphabetic, subject, numeric, and geographic - and their uses.
3. Reception of office visitors and telephone communications
4. Office management
5. Office arrangement - appearance and efficiency
6. Inter-relation of all 5 activities noted above to resemble realistic "busy" offices.

Distributive Education, Retailing and Selling

Objectives

1. To counsel students in their vocational and non-vocational subjects
2. To develop knowledges, skills, habits, attitudes and ideals

necessary for successful entrance and advancement in business.

3. To assist capable and interested pupils in preparing for further education leading toward management or professional business positions.
4. To provide experiences for students in locating, applying and being interviewed for prospective employment.
5. To provide related work experience programs or activities for pupils preparing for employment.
6. To provide an understanding of desirable employer-employee relations.
7. To provide experiences whereby students can see retail merchandising as it applies to selling, pricing, buying, displaying, stock controlling, and advertising.
8. To emphasize the development of personal and social competencies necessary for successful employment.
9. To develop a working knowledge of retail management and merchandising and its part in the total economic structure.
10. To help students improve their personal appearance and conduct.
11. To develop particular skills in selling.

CUSTODIANS' AREA

The custodians should be provided with appropriate closets on each floor and at frequent intervals to make materials and equipment realistically close for the work that has to be done. They should also be provided with a lounge with comfortable seating, tables, hot plate and carpeting. Adjacent but not necessarily opening off the lounge should be a shower and toilet unit, lockers.

FUTURE EXPANSION

The first consideration for expansion is the size of the site. Is it large enough for expansion? It should have been considered when purchased. Plans for the new school should also include areas to be expanded, the direction the expansion is to take place, and the form the expansion is to take. Particular care needs to be taken in planning expansions to see that the original educational concepts that were the basis for the new school are not violated by the expansion. For instance, should large-group instruction be an integral part of the educational philosophy for the new school and a new classroom wing were added with no large-group instruction area, one of the basic concepts would have been violated. The time to plan expansions is when you are planning the original structure.

FUTURE INTERNAL CHANGE

Future internal change can be planned in the original structure if the educational concepts upon which the program and structure are based are understood and rather explicitly stated. One of these concepts is that of the inevitability of change itself. All changes cannot be anticipated nor planned for so attention has to be focused upon those changes that may be desirable and forthcoming and compatible with the basic educational concepts to which a commitment has been made. Internal change may be identified as expansion of the educational program; external change as expansion of facilities that house the program. Each is dependent upon adequate planning, in line with specific objectives, at the time of original construction.

HOME ECONOMICS

Home economics education is concerned with improving all aspects of home and family life. Since the family is the basic unit of our society, the quality and strength of family life is extremely important to the welfare of our country. Preparation of students to cope realistically with the problems in a rapidly changing society calls for judgments and decisions that are tremendously difficult. The need for rapid change of curriculum content and of teaching methods will make flexibility of space and equipment imperative.

Program and Activities

The specific areas of study in home economics are: clothing and textiles, child development, foods and nutrition, housing and home furnishings, personal and family relationships, home care for the sick, management and family economics and family living.

Many activities will take place in the department. Students will listen, observe, read, study, discuss, write, experiment, record and view film. They will store, plan, prepare and serve food; entertain class or classes, faculty and parents. Students will also do home cleaning and laundering. They will plan, cut, sew and fit garments, learning about grooming and clothing care. Students will study home decoration and observe small children. Instruction in home nursing will be part of the program. There will be large and small-group instruction, as well as individual work. Many instructional materials including films, film-strips, and television will be utilized.

Space and Equipment

The spaces needed for the Home Economics Department include:

1. A laboratory for teaching food and home management.
2. A laboratory for teaching clothing construction, selection and care.
3. A multi-use room (including children's center) for teaching personal, social and family relations, housing and home furnishing, child development, care of sick, management and family economics.
4. A social area opening on a patio for providing learning experiences in hospitality and entertaining, home decoration, furniture arrangement and care. If enclosed and heated, the patio could be used during the winter months as well.
5. An office-conference-workroom area to be shared by teachers and used by students for special projects.

Foods Laboratory

This room should be designed for discussion-demonstration as well as for planning, preparing and serving foods. A desirable teaching group per unit kitchen is defined as four students. Six kitchens therefore should be located so that demonstrations may be conducted for a class.

Clothing Laboratory

This room should be designed for discussion-demonstration as well as for clothing selection and construction, care of clothing, grooming and other related experiences. Space needs will be determined around sewing machines where machines will be provided every two students.

Multi-use room

This room should be flexible in its use and designed for teaching such areas as: personal, social and family relations, housing and home furnishings, home care for the sick, child development and management and family economics. It should serve for lecture-demonstration and for use of audio-visual aids. Adjacent to this room, a child development center should be provided. This space should be separated from the main part of the room by a folding partition. This space should be flexible and serve other uses. A small compact type kitchen should be provided in the area near the child development center and serve as demonstration center in teaching other areas. This space should be equipped with low tables and chairs and appropriate storage space when play school is not in session. A small bathroom adjacent to this area is required with step arrangement for children.

Social Area

This space should be used to provide learning experiences that relate to hospitality, home decoration, furniture arrangement and care. Social area should be separated from clothing laboratory by large folding doors in order to provide flexibility. It should open off the food laboratory in order to facilitate serving of food for luncheons, dinners, teas, etc. It should provide a patio or garden area to expand space when weather permits. It should be furnished with appropriate living-dining furniture found in a home.

Office-conference-workroom Area

This space will serve such purposes as preparation of teaching materials, research by individual students, small staff meetings and the like. It should be easily accessible from all homemaking instructional spaces. It should be adjacent to the nurse's suite office.

Combination Food-clothing Laboratory

This space combines as a fifth teaching station for the homemaking area. It provides for small groups of students pursuing one semester courses of an orientation nature or specialized subjects. An operable wall separating the two areas of food and clothing will assist flexibility.

Special considerations

Orientation - The home economics department should be on the ground floor with an outside door adjacent to a patio area or driveway. Activities involved in the delivery of supplies, exchange of large equipment on School Plan, and removal of waste, demand easy access to a service drive.

Internal traffic

1. There will be considerable interchange of students among various rooms within the department. Easy access to all spaces within the department is essential.
2. Upon entering the clothing laboratory, students deposit coats and books in space provided. After washing hands they proceed to tote-tray storage and from there to the tables. From tables, the students move to sewing machines, pressing centers, and to fitting centers. The order of movement may be reversed or mixed. The furniture and equipment should be placed so as to provide or allow easy flow of traffic. Grouping of tables, machines and ironing boards into several work centers, rather than lining like

pieces in rows, is desirable.

3. Upon entering the food laboratory, movements will be from corridor into the laboratory to deposit books and coats in space provided, hence, to get aprons and proceed to unit kitchens. From the unit kitchen, some traffic will flow to supply area (staples storage and refrigerators). Serving tables should be placed so that one is accessible to each unit. Units should be so arranged that cross traffic does not occur.

Miscellaneous

1. Teacher should be able to maintain complete visibility of the entire room at all times. Separate dining rooms, fitting rooms and grooming areas should be avoided, and these spaces made as flexible as possible.
2. Provisions should be made, in all areas, for the use of audio-visual aids.
3. Team teaching, large-group instruction, greater use of audio-visual aids and variable scheduling should be provided for in the department.
4. In addition to necessary equipment, adequate space for comfortable seating of an entire class is necessary. Demonstration area with chalkboard in easy view is important.
5. 220-volt outlets should be provided for ranges and dryer. The dryer must be vented outside.
6. Hot water in each laboratory is essential. If the hot water source is in the department, provision should be made for

enclosing the heater.

7. Adequate double electrical outlets should be provided every 8 to 10 feet on all sides of the rooms.
8. A large space for large-group instruction (100) and Future Homemake meetings for use once a week should be provided. An acoustically treated folding wall, separating the clothing laboratory and multi-use room, should be considered.
9. The entire department should present an attractive homelike appearance. Institutional colors, equipment, and furnishings should be avoided.

It is recommended that the School Nurse be a functional member of the home economics department to assist in practical nursing units, child care units, care of the sick units, and others as they may arise. The increased emphasis on sex education and family living would appear to be most appropriately the responsibility of the nurse and members of the department.

As stated in the opening paragraphs, the concerns of the home economics department are the concerns of all girls in the schools as well as most boys. As with industrial arts, the home economics program must receive greater status among all students and teachers in keeping with the great value of its offerings. Much could be done toward integrating their course materials with those of other departments such as English, social studies, science, and physical education. Many of their materials and concerns relate more closely to the practical development of social and psychological dimensions of children than those of other courses with much greater status.

INDUSTRIAL ARTS

Objectives

1. Knowledge of the over-all impact of industry upon society, primarily through planning, design, and production in the laboratory.
2. Development of basic skills with tools and equipment commonly used by people in solving everyday problems of home living and also development of proper and safe attitudes and habits of work with tools, equipment, and materials.
3. Development of the ability to select, use, and maintain equipment and goods purchased by industry and used in everyday living, such as tools and machines, motors and engines, and electrical and household appliances.
4. Development of the interest and talents or discovery of the limitation of students through instructional shopwork in a variety of materials and processes which relate to future occupational choices.
5. Promotion of wholesome and worthwhile interests and abilities in creative and constructive work with tools and craft materials for leisure time and hobby activities. All activities in industrial arts classes should promote social experiences in working with others and afford opportunities to share, lead, plan, take responsibility, and cooperate in group activities.
6. Interest in achievement. To develop in each pupil a feeling of pride in his ability to do useful things and to develop worthy leisure time interests.

7. Orderly performance. To develop in each pupil the habit of an orderly, complete, and efficient performance of any task.
8. Shop skills and knowledge. To develop in each pupil a measure of skill in the use of common tools and machines and an understanding of the problems involved in common types of construction and repairs.

Program-Trends in industrial arts

1. Industrial arts curriculum is changing so that it is geared to the technology of the era.
2. Several kinds of industrial arts programs are being developed to appeal to students of all abilities. Making these programs increasingly available to college bound students.
3. Design in its broadest sense is being emphasized. For this reason, a planning center should be included in the shop area.
4. Applied science and mathematics are being emphasized in every situation in which a natural and practical application can be made.
5. Greater emphasis is being placed on the use of oral and written language, technical vocabulary, as it applies to each subject area.
6. Identifying interests, attitudes.
7. Increasing wage of instructional arts for vocational guidance.

Courses of study:

1. Electricity and electronics
2. Woodworking
3. Metals
4. Power mechanics

5. Drafting - general, architectural drawings, marine drawings, machine drawings
6. Plastics
7. Air and space technology

Activities

A great variety of activities takes place in a modern shop. As many as five areas of work may be going on during one period, with each student progressing at a different rate.

Student and teacher activities include:

1. Demonstrations - these can include entire classes or small numbers. Size of classes will be limited to 24 students, preferably 18-20, except for mechanical drawing (drafting).
2. Lectures
3. Study
4. Research (individual and group). More of this type program is now being used.
5. Drawing, planning and design (individual and group)
6. Testing
7. Observation of visual aids
8. Construction of projects - radios in electronics to chest of drawers in wood.
9. Evaluation of projects and products.

Storage areas - Supplies, tools, projects, office

1. Material storage rooms should be provided and located conveniently for the unloading of delivery trucks and for issuing materials to

students. Three hundred square feet is a minimum for wood and metal shops.

   a. Storage for the metal area must include horizontal storage space for lengths of pipe, band, and rod.

   b. Wood storage must include storage for up to 16-foot pieces of stock as well as storage for plywood panels of standard sizes.

   c. Suitable storage for the drafting room and the electronic laboratory should be made available.

2. Both the supply room and tool panels should be so located that students in reaching them and returning to their work stations pass as few other work stations as possible.

3. Storage panels on the wall for the tools used in each area of work should have doors and locks. Each shop will require at least one hundred square feet of panel space. For large portable tools a bench cabinet or supply room space with locks should be provided.

4. Room for the storage of the supplies and special tools used in evening classes and the storage of projects made should be provided in shops that are to be used extensively for evening classes. At least one hundred and fifty square feet of floor space or balcony storage.

5. Project storage room free from dust and well-ventilated with benches for wet projects is essential. Three hundred square feet is a minimum for this room.

6. A small shop planning room or equipped instructional space in the open shop area is highly desirable for planning, instruction,

and related studies. If a classroom is feasible, three hundred and sixty square feet (15x24) is large enough for most shops. This may be equipped for the use of visual aids as well as the teacher's desk, chairs, and tables, chalkboard, tackboard, shelves for books and cabinet for instructional materials.

7. Storage space for:
    a. 24 reams, 12 x 18 inch drawing paper
    b. 1 small blueprint machine
    c. Storage for finished (100) drawings for all students for full year.

It is recommended that college preparatory students be encouraged to participate in industrial arts activities. If they were to participate, special courses and programs of experiences may prove to be desirable depending upon the time available to them and the sequences of experiences possible.

LIBRARY (Media Center)

Introduction

In keeping with the ever-widening scope of knowledge, the increasing demands upon modern education, and the tremendous advance in technology, no single medium of communication will suffice for the individual and class needs of today's instructional program. An abundance of instructional materials of all kinds, printed and audio-visual, is essential in every school.

In order that the various instructional materials, printed and audio-visual, may be integrated and used effectively, they should be assembled, as far as possible, in a central technical processing area where they can be organized for convenient utilization. The materials should be properly cataloged in one central card catalogue file so that students can readily determine and locate the holdings of the school on particular topics in all media provided. In the interest of wide utilization of materials, provision should be made for their use within the library as well as within resource centers located in or adjacent to classroom instructional areas for convenient circulation and distribution of materials and equipment.

Objectives

The objectives of the library and its subsidiary resource centers will be consistent with the philosophy and objectives of the school - or should be! However, the intermediate goals should be to:

1. Provide opportunity for individual work in order that students may study at their own rates and in their own ways according to their needs and abilities. (This means providing for exploratory

work to give students an opportunity to extend boundaries of knowledge and experiences and to satisfy curiosities.)

2. Facilitate behavioral change, which will demand consistency and direction.
3. Make the library an integral part of the school, which will supplement, complement, implement, and parallel classwork. (This involves cooperative planning with teachers and students for projects and research.)
4. Create a source of knowledge and information.
5. Provide resource materials - processed in a single place for administrative purposes, but accessible to all areas of the school for group and individual work.
6. Promote desirable working relations between administration, teaching, and library personnel.
7. Create an atmosphere conducive to achievement of goals. (Through development of reading, listening, and viewing tastes, the library will continue to the student's growth in critical judgment and appreciation.)
8. Operate a technical processing center to separate the mechanical functions of the library from the educational function. (This includes a technical processing center and an audio-visual distribution and repair area.)
9. Provide personnel capable of carrying out these functions and prepared to teach skills in the use of the library and its various facets.
10. Become an integral part of the education program of the community.

Program of services and activities

One of the advantages of a library is the opportunity it affords for developing a dynamic program. Providing a rich collection of diversified materials is important, but the collection is valuable only to the extent that an accompanying program of services makes it readily available and accessible.

A commendable program strives to meet with increasing depth and breadth the individual needs, interests, and abilities of all students and teachers. It also provides continuity and sequential experiences in the development of library skills. The program is not confined only to services within the library's own quarters, but also reaches out to all areas of the school to serve and to enrich its entire program of learning experiences.

The program should be well organized but flexible, continuously improved and extended in keeping with modern educational practices and trends, geared to individual and group activities, and closely related to the curriculum practices of the school. The program offered should vary according to the needs and interests of the students and faculty, and according to the pattern and organization of the library.

Some activities and important services available in and through the library of a comprehensive high school are:

1. Individual and group use of all types of instructional materials within the library, including reading, listening, and viewing activities.
2. Reference and bibliographic services for students and teachers related to all types of materials.
3. Reading guidance for individuals and groups to serve curricular

and personal needs and interests, and to make reading experiences meaningful and vital.

4. Appropriate materials in diverse media to challenge the gifted and to assist the under-achiever in reaching his highest potential development.
5. Guidance projects and activities to help students become intelligent users of all types of instructional materials and to select the media best suited for the purpose at hand.
6. Instruction in the techniques and the skills of locating and utilizing all types of instructional materials.
7. Training and activity program for student assistants.
8. Opportunity for independent study and research activities.
9. Effective information program regarding available materials and services.
10. In-service training program to inform teachers of the library's resources, to assist them in development of skills necessary to prepare teacher-made instructional materials, and to encourage experimentation in new techniques of utilization of resources.
11. An up-to-date centralized card catalog file incorporating varied types of materials belonging to the library and to the various instructional resource centers.
12. Compilation of varied lists of materials: films, film-strips, tapes - both audio and audio-visual, books, periodicals, models, pictures, art objects, etc.
13. Organized listing of community resources.
14. Systematic circulation, distribution, and servicing of materials and equipment.
15. Provision for book and film and art, etc. talks to classes and

special projects.

16. Inter-library loan service and rental or borrowing of films, recordings, tapes, etc. from outside agencies.
17. Professional and technical assistance in the selection and purchase of materials and equipment.

Facilities and equipment

The development of an effective program of services is of great importance, and the nature of the quarters and equipment to a large extent influences the services to be offered. Services that contribute to creative teaching and to all phases of the instructional program require functional quarters and equipment, conveniently located, well designed, and attractive in appearance.

The physical provisions of the library - Their extent and pattern vary according to the size of the school, its educational objectives, the program of offerings, the extent and type of materials collection to be housed, and the breadth of the library program to be developed. In general, quarters should be provided to appropriately house all types of instructional materials - books, pamphlets, periodicals, pictures, maps, charts, models, art objects, films, film-strips, tapes, recordings, etc.; for convenient acquisition, processing and circulation of materials; for storage, maintenance, and circulation of equipment; for use of resources within the library and the various resource centers; for production of materials, for reception and display areas; and conference, work space and administrative purposes. Standards for facilities and equipment for varying sizes and types of school organization are available from the American Library Association and the Department of Audio-Visual Instruction of the National Education Association. The architect should become familiar with these standards, both qualitative and quantitative, and should refer to them periodically. (The American Library Association has recently completed a revision of its standards. The revisions are reported to be considerably more demanding than those that were revised, copies of the revised standards not now available for general distribution. A note of warning should be sounded in following the standards unless they are organized differently then were the old ones. The standards previously in force seemed not to reflect the needs of different kinds of programs; the implication being that all schools needed the same things in like amounts, the same size spaces, the same equipment, etc.. It is possible, for instance, that should independent study be encouraged in the regular instructional areas or in a student-activities-cafeteria area, that less than the recommended space for reading would be needed in the library. Even more to the point is a school that has such a rigid schedule that children are not free to go to the library to read during school hours. If this is the program being implemented, then many of the standards are not applicable.)

It is important that these facilities relate to the stated needs of the school and that they be as forward looking as possible in contributing to an ever-improving instructional program. There has been a careful re-examination of facilities in many schools in the light of tremendous changes in materials, communication media and equipment, and technological production of materials all but impossible if even imagined a decade ago. But it has not been enough that schools reassess where they are now; they must project this position into the future, a future that promises to be more rapidly changing than the past, more innovative than the present. Results of these views of the past, present, and future indicate need for the following areas in a comprehensive high school:

Main Library

1. Browsing and general reading: Located at the entrance to the library, this area should serve as a focal point for all of the center's service functions. The atmosphere should suggest informality, friendliness, and invitation. The area should include (a) an entrance and exit; (b) recreational reading materials; (c) small-group conversational areas; (d) periodicals; (e) circulation desk; (f) card catalog (color coded and including all materials of all types available in the library and resource centers); and (g) display area.
2. Reference and research: Adjacent to Browsing and General Reading, this area should house the reference collection of each of the broad subject fields of the curriculum. Each section should be arranged to assist the student in individual research. Flexibility should be maintained through the use of low bookcases as room dividers. Individual study spaces for students doing reference work should be located immediately adjacent to the material sought.
3. Technical processing center: Serves to separate the mechanical function from the educational functions of the library.
    a. Workroom and storage area for printed materials used primarily by librarians and library clerks for acquisition, storage, processing, and organization of books, periodicals, and other printed materials should include these: work area with sink, counter, work tables, shelving for 300 to 600 books; storage for general library supplies and

for books in need of repairs.

b. The Audio-Visual area is to be a repository for all instructional resource aids other than books and periodicals and includes space for: (a) storage of films, film-strips, models, prints, records, tapes, etc.; (b) circulation-catalog area and work area for the audio-visual materials clerk; (c) limited storage area for audio-visual equipment (the majority of this equipment remaining in the various resource centers adjacent to classroom areas); and (d) student-teacher area equipped with individual study carrels which provide semi-private space for listening, looking, and operating teaching machines and programmed learning materials. Students will be assigned to the different spaces, depending on the degree of responsibility they bring to independent study.

4. Instructional Materials Production Laboratory: More often called a "production laboratory," this facility is intended to provide a show-case for effective learning materials. In addition, it should serve as a work center for producing instructional aids, providing the teacher and selected students the kinds of tools, equipment, supplies, materials and assistance necessary to produce all types of audio and visual materials. It should include (a) a general work area for the production of models, graphs, pictures, visuals, etc.; (b) facilities for photo production utilizing all types of photo equipment for processing, enlarging, copying, and production of all types of visuals; (c) a darkroom to be used in conjunction with the photo production equipment; (d) storage for materials, equipment and tools needed for these activities;

(e) work area adjacent to all of the spaces above to conserve equipment and to make full use of the laboratory clerk's time; and (f) office space for the graphics technician.

5. Electronic Distribution Center: This facility represents a step into the future because the potential for the application of electronic technology to the improvement of education is just now being suspected. As amazing as are the applications to date, one might say that the door to a room to a house full of rooms has just become unlatched. Consequently, the center should have more space than at first seems necessary with expansion a definite part of the school building plans.

    As a school equipped with classroom monitors and an antenna system to receive AM-FM and TV broadcast signals, it is important to provide facilities for originating closed-circuit telecasts (a state of sophistication has already been attained where monitors and an antenna system are assumed). Closed circuitry will also provide a film chain, "spot" programs, programs for team teaching, etc. The Electronic distribution center should operate as an electronic control center for the entire school. It should house the equipment necessary to provide closed-circuit TV or radio programming to any location on the campus. These spaces should be provided: (a) an electronic control center containing all equipment necessary for production of closed-circuit TV; film, slide, and filmstrip projection; radio, tape, and broadcast television; and facilities for live programming from any area of the circuit, plus any combination of the above; and (b) an area for preview, production, and conferences where these three functions will be accommodated through proper scheduling. This space should be designed to house the production of live TV programs, the preview of films and other audio-visual materials, recording activities, and conferences.

Space and equipment also should be provided for the installation of tape decks and dial access systems. Vidio-tapes, audio-tapes, records, films, filmstrips, slides, and even materials projected by means of TV cameras could be available to any resource center, classroom, or large-group instruction area by merely dialing the center. Of necessity, the center, particularly this section of it, would have to be in close proximity to the Audio-Visual Area. Involvement with the Instructional Materials Production Laboratory as well could promise untold benefits for students, teachers, and auxiliary personnel.

6. Office Space for the librarians, audio-visual materials specialist, graphic technician, and library clerks, as well as the specialists in the Electronic Distribution Center, should be located in the areas where these staff members operate.
7. Display: Space should be made available throughout the library and resource centers for display of all types of interesting and stimulating materials.

Resource Centers: These have been advocated and described in the section dealing with the classroom instructional areas.

LUNCH FACILITIES

Expenditures for hot lunch facilities have been a large part of the building costs. It is recommended that serious thought be given to the benefits derived from such expenditures. Initially the hot lunch program was intended to provide at least one hearty meal for each student each day, particularly students from depressed areas, families in poverty, families on relief, etc.. Questions frequently asked concern not only the quality of meals but of whether the students who are supposed to profit from them actually eat them and whether students in affluent areas need them or eat them.

It is recommended that a student activities area can be planned for individual and group study and conversation where food dispensors are available. It is also recommended that small student lounges be planned in each instructional area to serve the same purpose. With large time block scheduling, small group activities, and independent study students should be permitted to eat when they are hungry rather than when a bell rings, and that they have a choice of what they want to eat. A snack bar could be a part of the large student activities center. These suggestions would eliminate the need for the very expensive kitchen furniture and equipment and the personnel to operate it. They could eliminate the construction of a massive, low ceiling area so often planned as a cafeteria and relatively useless for educational purposes except study halls. The ineffectiveness of study halls having been proved over and over again and educators finally moving to curtail and even eliminate them, the cafeteria area even loses this questionable educational function. Let us design educational areas first, food service areas next but only as they complement the educational areas, the educational objectives.

MUSIC

Total music department space will consist of separate areas for instruction in instrumental music and vocal music as well as auxiliary spaces which will be used jointly for vocal and instrumental activities.

The music department suite should consist of one or more of the following areas depending upon the extent of music offerings: instrumental rehearsal room, vocal rehearsal room, practice rooms both for individual and ensemble use, storage room containing an instrument repair and maintenance area, and an office space with music library to be shared by the music instructors.

Objectives: At the secondary level, music is both a group art and a private art and has both group values and individual values. Both recreational and aesthetic purposes are served by music instruction. A variety of activities and experiences in the music program provides for:

1. Greater discrimination in the appreciation of music.
2. Identification and cultivation of individual aptitudes and interests.
3. Development of technical skills to permit not only effective participation in school muscial activities but to encourage the use of these skills in leisure-time activities or as a foundation for the future development of these skills to a professional level.

Music education has developed from an essentially supplementary activity to one which is becoming increasingly recognized as an independent subject of considerable variety and scope. As a result, music is being offered on an equal credit basis with other subjects and is accepted by colleges for entrance requirements.

Acceptance of the long-range value of music instruction for adult, leisure-time activity has resulted in greater emphasis on individual instruction with a decreasing emphasis on performance groups. On the other hand, the variety of offerings in music departments has also increased as a reflection of the greater utilization of music facilities for the development of leisure-time and adult interests. Courses such as music theory, general or exploratory music, and dance band instruction are increasingly prevalent. School music facilities are increasingly utilized by adult and community groups.

Program: Depending upon facilities, interest, emphasis, and support by administrators and community.

1. General music
2. Music theory
3. Organization
    a. Band (beginning, intermediate, advanced)
    b. String orchestra (beginning, intermediate, advanced)
    c. Vocal (beginning, intermediate, advanced, remedial)
    d. Stage band
    e. Solos and ensembles (all levels)

As indicated above, the identification of facilities by size and by number is not practical without consultation with those who will be directing the program (will they want large bands and large vocal groups or will they want more but smaller bands and vocal groups, etc.) However, there are certain special considerations that apply to most facilities:

1. Location: The music department should have access to an auditorium or little theater, be isolated from noisy areas such as shops

and physical education, either geographically or by sound treatment.

2. Acoustics
    a. Avoid parallel surfaces
    b. Have minimum amount of glass
    c. Ceiling height should not be lower than 14 feet.
    d. Heat and ventilation fan noise should be kept at a minimum
    e. All rooms for instructional work, including practice rooms, should be completely soundproof.
    f. Sound isolation (spray paint will not stop sound; brush on)
    g. Sound distribution control (there are "dead" spots)
3. Climate control - thermostatically controlled
    a. Adequate heating
    b. Air conditioning
    c. Ventilation (air conditioning) in small rooms as in others
4. Lighting and electrical
    a. High intensity fluorescent lighting suggested because of difficulties encountered in reading small manuscript writing.
    b. Outside lights in parking area for use in night rehearsals.
    c. Every practice area needs electrical outlets for use of stroboscope and other electrical equipment and instruments.
5. Miscellaneous
    a. Shape of large rehearsal rooms - Attention should be paid to the traditional arrangement of bands, orchestras, and choruses as guides for planning these rooms.
    b. There should be no support posts in the large rehearsal areas.
    c. Preferably no windows in large rehearsal rooms; if there are

windows planned they should be located at the back of the rooms.

d. If there are windows in the large rehearsal rooms they should be draped (no venetian blinds).

e. If risers are built-in, attention should be paid to availability of storage space underneath.

f. There should be a loading ramp between band room and driveway with no steps.

g. Uniform and robe storage room should be accessible to rehearsal rooms and the recording room, if planned.

h. Chalkboards should be green, partially music lined.

i. Wall hangings should be provided (ridges on walls).

PHYSICAL EDUCATION

The physical education facilities should be designed to serve the total enrollment in terms of actual participation and spectator sports. The gymnasiums must be planned for both physical education classes and inter-scholastic athletics. One of them must serve as an auditorium for student assemblies, programs, and related activities. In addition, it must be adaptable to large school dance activities.

The program should require facilities for ten full-time teacher stations (12 full-time teachers). Approximately 30 students should be assigned to each station except where otherwise specified. Both outside and inside physical facilities should be planned for ten stations so that inclement weather will not curtail the program. The inside teacher stations should include 2 gymnasiums (2 stations each); 1 dance studio, 1 corrective room, 1 gymnastics room, and a weight training room; and 1 swimming pool, 1 track.

Locker rooms and dressing facilities must accommodate a full program each class period.

Outside stations will include football playing field, practice field, archery field, volleyball court, tennis courts, basketball courts, and other areas as designated.

Educational Outcomes

Physical education, as conceived by the profession, consists of a basic instructional program for all. It is supplemented by a voluntary program of extra-mural and interscholastic sports. The intramural program is to be considered an integral part of the basic instructional activities. Because the profession is interested in the welfare of every boy and girl, it is generally agreed that the relative importance of the segments of the program are in the order listed above: basic instructional with intramurals, extra-murals, interscholastic. Popular opinion and pressure from the public have altered the emphasis until the interscholastic program has achieved a prominence out of proportion to the number of youths involved. The profession is not opposed to the development and has taken the attitude that the spectator's interest is beneficial to the total program. There is, however, a pitfall which must be avoided or the total program will ultimately suffer. The development of the interscholastic program, at the expense of a well-rounded program in which all students participate, must be avoided. It is essential to help youth learn that sports should occupy an avocational segement of their lives rather than a major and consuming interest.

Objectives

The physical educator is interested in the total development of the individual. Although it is realized that one cannot take a child apart, it is easier to elaborate on our goals if some assets of the total goal are discussed. The contribution of physical education to the total development of the individual will be considered here under four major headings: physical, psychological, social, emotional-recreational.

Physical: Physical education's major responsibility and most unique contribution no doubt lie in this area. This department is the only division of the school curriculum that administers to the physical needs of youth. Every day, science adds to the data already available indicating the need for physical exercise in the normal growth and development of youth. The development of vigorous physical resources is, in these days as in the past, a significant prerequisite to a useful and satisfying life.

Psychological: Contributions to psychological developments through physical education relate to one's opinion of himself. Among youth the feelings about one's self begin with the physical self, relative to what one can or cannot do. Through the process of maturing, a self concept encompasses a broader and broader scope. However broad one's concept of self becomes, the basis of these concepts is physical because the physical qualities one possesses are seen and felt, and are tangible. Thus, it is important that every child feel physically competent within his real limitations. It is also important that the physical educator help a gifted child to see that physical activity is but a _segment_ of his life, not _the_ goal of life.

Social Development: Any team sport contributes a social environment and a group membership that is so important to the adolescent. This kind of membership and group loyalty is essential to the development of that feeling of belonging to and identifying with one's friends, the school, city, state, and nation. One must feel this identification strongly if he is to defend his nation against agression.

Emotional Development: In a society such as ours, certain emotional controls are expected or severe penalties may be suffered. One must learn to play the game of life within the limits of social restrictions. Sports have their rules too, and to play a sport according to the rules and etiquette of the game is to play the game of life according to the expectations of that society.

The development of physical skills that have recreative value has long been offered as a desirable objective of physical education. It has been found that if adults engage in physical activity as adults, they enjoy it as youth; that we all like to engage in physical activity in which we possess some skill. This concept of "carry-over" has had much support in this field but many feel it is not sufficiently broad. Certainly the psychological, social, and emotional attitudes that have been developed as youths, remain with them throughout their lives; whereas the physical capacity diminishes through the years. One might go so far as to say that these attitudes, developed as a result of participation in carefully supervised sports and rhythmic acticity, are perhaps as important as the actual physical participation.

Specifically, the, the physical education program should work for the following outcomes for all boys and girls:

1. Physical strength, agility, grace, and endurance
2. An appreciation of the value of cooperation, good citizenship, and a sense of fair play
3. Emotional maturity and self-reliance gained through the experience of belonging to a group or team and being accepted by his peers
4. Desirable habits in health, sanitation, and safety
5. Skills in, and a liking for, a variety of carry-over skills for leisure time use.

Trends:

There is an increasing emphasis on individual and dual activities and on coeducational activities. It is essential that youngsters have some contact with many different education activities; therefore, common practice provides ample opportunity for all individuals to participate in a variety of physical education experiences. This avoids over-specialization in any one activity. In general there is a growing emphasis on instruction in swimming, dancing, corrective posture for the girls, and to some extent gymnastics, wrestling, and weight training for the boys.

Maximum use of schools by community groups, in non-school hours, is advocated and is gradually developing, especially in connection with recreation-type activities. This trend has implications not only for greater space and facility provisions indoors and outdoors, but also for proper planning and space relationships.

An increasing number of men, who teach academic classes but who have skill and training in specific sports, are assigned to coaching positions of athletic teams and to helping with intramural and recreational activity supervision. This trend implies more space and facilities in the staff office, dressing and shower and toilet area.

Activities:

Students are required to change from street clothes to a uniform suitable for individual and game activities. The uniform, provided by the student, is stored in an assigned locker. Equipment is issued as needed for the period's activity. Each student is expected to shower at the conclusion of the physical activities period. Clean towels should be provided each day by the school system. The towels must be issued and collected in an area adjacent to the locker area.

Often classroom instruction and tests on rules of the game are given. In connection with discussion of rules and tactics of games, movies, film-strips, and slides are shown occassionally.

Space and equipment for the following activities should be provided (activities marked with an asterisk (*) will require indoor space in addition to paved surfaces outdoors).

Boys: Badminton*, baseball, basketball*, calisthenics*, diving and swimming*, track, tumbling*, volleyball*, wrestling*, adaptive P.E.*, archery, body mechanics*, bowling (modified*), dancing (social, modern, square, folk)*, fencing*, gymnastics*, handball*, horseshoes, soccer, tennis, (backboard practice*), trampoline*, and weight training*. Ice hockey is desirable*.

Girls: Archery, badminton*, basketball*, body mechanics*, dance (modern, creative, folk, square, social)*, field hockey, life saving*, swimming and diving*, restrictive or adaptive P.E.*, softball, speed-a-way, tennis, tumbling and gymnastics*, bowling (modified)*, fencing*, golf, and trampoline*.

Many sports and physical education activities traditionally identified as a part of either the boys' or girls' program are becoming acceptable for both: modern dance, fencing, track, gymnastics, archery, and field hockey are but examples. These should not be omitted from consideration when formulating final programs.

Coeducational: Archery, badminton*, volleyball*, social dancing*, recreational tennis, softball, swimming, and basketball*.

Interscholastic athletic activities: football, basketball, cross country, ice hockey, water polo, wrestling, track, baseball, swimming, tennis, golf, field hockey, softball, soccer, gymnastics, weight lifting, skiing, table tennis, bowling, and archery are possibilities depending upon facilities and interest. The women's department will conduct sports' days or activity days, the aim of which is to provide maximum participation in a variety of physical activities.

Orientation and relationships

The physical education facilities should be located away from the principal instructional areas but be close enough to permit students to walk to the locker-gymnasium area and the play fields during the time allocated. It should be accessible to the public for any community use that may be anticipated. There should be exits toward the play field as well as toward the instructional areas. Should the facility be used for team activities after school hours and for recreational purposes during the summer, as indeed it should, it is essential that it be possible to block off dressing, shower, toilet, and storage areas from the main arena so that such facilities can be used with a minimum of supervision and difficulty.

The orientation of outdoor courts and fields should be such that the late afternoon sun will not deter participation in game activities. In general, this would require a north-south orientation of courts and fields. Hard-surfaced courts are usually placed in a closer proximity to the gymnasium buildings than fields, so some consideration should be given to the movement of traffic past the court areas in the event games are in progress, or courts fenced. The baseball field is best oriented if home plate is to the north with second base to the south, although some authorities prefer the reverse, home plate to the south, second base to the north.

The physical education offices should be located so that instructors can supervise as much of the shower room, locker room, gymnasium, swimming pool, and playing fields as possible. It is desirable to have at least one office elevated somewhat so that vision over lockers is facilitated. The equipment issue room should be located in the vicinity of the offices to provide for easy supervision.

From the standpoint of economy of space and money, it is desirable to arrange varsity locker rooms and visiting team rooms so as to allow the same shower installations to be used for all activities.

Provision should be made for an outdoor storage facility adjacent to the football and track areas. The type of equipment stored here would include hurdles, starting blocks, high jump and pole vault standards, poles for vaulting, shot, shot put foul boards, tackling dummies, blocking sled, field marking compounds, and field marking equipment. A similar but much smaller facility should be accessible to the women's activities areas for their equipment.

Internal traffic

Movement within the department originates from all areas at one time or another. Foot traffic would enter the locker room from the instructional areas, proceed to lockers where clothes are changed, then continue to the appropriate activity areas. A similar pattern of traffic would be followed by individuals participating in interscholastic sports. After participation, students would re-enter the locker room, proceed to lockers to remove clothing, move to the showers (picking up towels on the way), shower, dry, return to lockers to dress, and deposit towels in a central location, preferably on the way to the exits. With minor variations depending upon the sizes and arrangement of lockers, these patterns of traffic would be similar for both boys and girls.

The shower-locker area relationships would be arranged so that traffic between the locker and shower areas would not contend with cross traffic.

Furniture and equipment

Individual lockers or baskets will have to be provided for all the students, 3000. Whether these are baskets (not recommended), or 1'x1' lockers, or half lockers, or full-length lockers, combinations of two or more, the final decision will have to be made by school personnel according to personal preference, room available, and cost.

Indoor seating for spectators must be provided in both gymnasiums. It is assumed that the seating in the girls' would be considerably less than that in the boys. The seating should be of the sectional, telescopic bleacher-type so that floor space will not be continuously utilized by bleachers. In addition they should be of the type that can be pulled out to any desired seating capacity and locked in place. This will provide greater flexibility for dances, physical education classes, and assemblies. Careful consideration must be given to the number of seats to be provided. Seats provided for assemblies involving the total school population, the large attendance at graduation, athletic tournaments, and the like are generally wasteful of space and money when considering the relatively few times they are used. The educational value of such facilities must be primary, especially when compared with other facilities for which the funds could be used.

Office space should be provided for six men and six women instructors. Each area should be provided with wall cabinets with adjustable shelving for storing materials and small items of equipment. Each area should provide a full-length locker for each instructor with extra lockers for part-time assistants and coaches from the other instructional areas. Women generally prefer a modular classroom coat closet rather than lockers. Each desk, cabinet and locker space should have locks.

Adjacent to each office space should be two showers and a toilet. The shower unit should be separate from toilet unit, with separate entrances. The women's area should have a separate grooming table with mirror.

Each office area should provide a 6' section of chalkboard with 6' of tackboard on either side. Outside the office space, and accessible to students entering and leaving the locker rooms should be a 6' section of tackboard and a similar section of chalkboard.

Adjacent to or part of the office space should be a cot for a student or instructor temporarily ill or waiting for the school nurse or doctor.

The area selected for use of a gymnastics teaching station and physical testing area should provide for the installation of at least one chinning bar which could also be used as a horizontal bar in gymnastics activities. The gymnastics room should open onto the main gymnasium floor by a large sliding or double door to enable mat trucks and parallel bars to be transported from one area to the other. There should not be a sill or other obstruction under the door to impede the movement of equipment from one area to another. A storage area for the gymnastics equipment that is accessible to both the gymnastics room and the gymnasium would lend additional flexibility to the use of both areas. The rope climb and swinging rings will be accommodated in the main gymnasium area. Floor plates for standards and apparatus will be needed in both the gymnastics room and the gymnasium.

Facilities to accommodate a double-faced electrical scoreboard and a public address system should be provided in the main gymnasium area.

Swing-up type goals should be provided.

Large electrically controlled doors should divide each gymnasium into three separate teaching stations. There should be no open space above the doors.

A classroom should be accessible to the men, and one to the women. Each should be equipped with 30 tablet-arm chairs, a teacher's desk and chair, 12 to 24 feet of chalkboard, and an equal amount of tackboard, and 12' of portable book shelf space. Each room should be equipped with curtains or other means of darkening to permit the use of audio-visual aids.

The room designated for coeducational activities should have a built-in record and amplifying unit. Several portable units should be available for use in other areas.

Adequate sanitary napkin machines and disposal units should be provided in the girls' locker-dressing room and in all girls' toilet rooms.

Mirrors should be provided in both dressing room and toilet areas in both departments. In boys' areas, mirrors mounted 10' high and slanted provide easy supervision and low maintenance.

The decision to have or not to have a training room should be weighed carefully in terms of its staffing, equipping, and use. In terms of these variables as they exist in most high schools, the decision to have one would appear questionable at best. Adequately staffed and properly equipped a training room can be a definite asset to any program, assuming that students have the time to partake of its benefits.

Utilities

Electrical outlets should be provided in every room within the physical education complex. In large rooms loud speaking systems may be installed and there is always the possibility of using television, radio, and audio-visual equipment. Additional electrical outlets should be provided within the girls' locker rooms so that electric hair dryers may be installed.

It is recommended that one shower head be provided for every three boys, one urinal for every 30 boys, one toilet for each 50 boys, and one wash basin for each 50. Individual shower stalls are recommended for girls, one for every 3, two toilets for each 50 girls, and one wash basin for each 50 girls. With the anticipated load of each period being 150, there should be a minimum of 50 shower heads, 5 urinals, 3 toilets, and 3 wash basins in the boys' locker room; 50 individual shower stalls, 9 toilets, and 3 wash basins in the girls' locker room. Two drinking fountains should be placed in each locker room.

Shower drains should be placed so students do not stand in water while showering. Each individual shower stall should provide the same consideration. In addition, for ease and efficiency of cleaning, the floor of the stall should be a smooth extension of the outside floor. Curtains for the stalls should be no higher than shoulder height for adequate supervision.

An outside phone should be installed in both the men's and women's offices for scheduling activities and for emergency calls.

Adequate restroom facilities should be provided for the spectators. The same formula as that used for determining locker room requirements should suffice.

Drinking fountains and cuspidors are needed at each end of the gymnasium area. They should be in separate recesses and accessible when bleachers, if at the ends, are in an open position. A battery of drinking fountains should be located adjacent to the athletic and playing fields.

If necessary a signal bell system should be adequate to serve both indoor and outdoor areas.

Audio, Visual, and Thermal

Acoustical provisions: To facilitate student control in the locker rooms and shower rooms, acoustical treatment is certainly desirable. Acoustical control of the wrestling and dance studios is highly desirable in view of the fact that instruction is often given in both activities and music is utilized as well as to accompany the dance. In many gymnasiums the reverberation is so pronounced that it is difficult for an individual to be heard from only a few feet away. To be effective for large group activities such as assemblies,acoustical treatment is imperative. It is no less desirable for effective instruction in physical education activities. Acoustical treatment of such large areas is not always practical but this does in no way reduce its desirability.

Lighting provisions: The major problem in gymnasium construction relative to lighting is that of lighting the gymnasium itself. Most often, lights are installed in the ceiling or suspended from the roof and replacement is both hazardous and difficult. Indirect lighting would be most desirable if not most feasible. Lights in the ceiling should be recessed and covered by a durable yet highly translucent material. They should also be accessible from above the ceiling. Windows in the gymnasium are undesirable because of the interference of the sun's rays with whatever activities are taking place. Darkening a gymnasium with windows for the use of audio-visual equipment is at best difficult and at worst expensive.

Ventilation: The physical education complex, as all other instructional areas in the school should be air conditioned. The steam and the odors and the stale air of the locker rooms makes forced air ventilation generally inadequate. It also does little in the way of positive temperature control. Forced air ventilation may be effective in the gymnasium for replacing stale air but again, is not effective for controlling temperatures. As in most classroom areas, once the students enter, the problem becomes one of cooling rather than heating. With spectators in the stands, the problem in the gymnasium becomes even more serious. The use of school facilities the year 'round, a practice long needed only recently implemented in an ever increasing number of school systems, reinforce the need for air conditioning as the means to more fully realize the educational values for which the school was constructed. The schools often appear to be the last on the list for making use of practices already accepted by industry and homeowners. Such appears to be the case for air conditioning.

Heating provisions: As stated above, most of the problems are not with heating but with cooling, the maintenance of constant, desirable temperatures. Although coal, gas, and oil have been the principal fuels for heating systems, renewed attention is being given to electricity as the heating source. For a new school, electric heat should be given primary consideration. Installation costs seem lower, maintenance costs lower, heating bill higher, but convenience and satisfaction greater than with other fuel sources. Recent trends would strongly suggest that the costs for heating with electricity will continue to decrease.

Storage: The storage requirements for the physical education department are numerous and varied. At this time it would be difficult if not unrealistic to identify these requirements without knowing the specific program to be implemented and the direction it is to take. Suffice to say that the storage areas should be designed on the basis of exactly what is to be stored, its sizes, shapes, weight, mobility, use and area of use.

Special considerations:

In addition to the previously listed requirements, the following special requirements should be considered:

All projecting surfaces from walls should be avoided, and where they cannot be avoided they should be elevated to a point where they cannot be an obstruction to participants in game activities.

The wall and ceiling surfaces should be treated to resist deterioration caused by moisture.

Provision must be made for commercial delivery trucks to conveniently deliver towels or athletic equipment to the gymnasium without crossing student traffic lanes to and from the outdoor facilities.

Lobby: Some facility should be provided in the lobby to accommodate ticket sales. Traffic control must either be located at this point or at the entrance to the gymnasium. If refreshments are to be sold some provision must be made for this activity. Restrooms for men and women, as previously described, must be available. Some facility must be provided for coats and wraps.

Outside hard-surfaced multi-purpose area: Many schools tend to ignore the need for such an area at the high school level although providing such for elementary schools. A suggested all-weather area would be 120' x 200'. It provides for many court activities - such as basketball, volleyball, badminton, shuffleboard, etc. - not only during school time but also after school, during weekends, and during vacation and summer sessions when schools are closed.

Sizes of areas: A general guide for providing locker room space is 14 square feet per student plus area needed for lockers.

A suggested size for the gymnastics room would be 30' x 70'.

The sizes of the various areas can best be determined by inspection of the uses to which they are to be put, by the number of students to be involved at any one time, the types of furniture and equipment selected and its arrangement. Sizes of courts are readily available for physical educators. The number, sizes and layout of outdoor areas will depend on program, participants, and the dimensions, contour, and geological features of the site.

SCIENCE

Impressive strides have been made during the past decade in revising the approaches to curricula and the teaching of science in our schools. Most schools now pride themselves on having the new courses produced by national study groups. However, the course offerings in any school will depend primarily upon the talents and training of teachers, the attitudes of community groups, and the objectives defined for the teaching of science. Current developments are based upon the belief that students learn and retain much more when they have discovered an idea themselves than when it is presented by an instructor or in printed materials. Consequently, approximately half of the class time is devoted to laboratory work in which students are given an opportunity to explore ideas and make discoveries for themselves. Memorization of facts and unrelated data is kept to a minimum. A great deal of emphasis is also placed upon vocabulary and word derivation; particularly as they apply to the terminology of science. Consequently, courses such as Human Biology and Physical Science, which are designed for the less talented students, should utilize the laboratory approach. Past experience has proved the lecture method of teaching to be of little value as technique in science instruction.

Program

Since students attending this school will represent all levels of interest and ability, a broad variety of courses will be needed. As the school grows in population and diversity of student abilities and interests, the following listed courses would appear to minimal requirements in the science curriculum:

1. Earth science - several levels

2. Biology - several levels
3. Human biology -
4. Chemistry - several levels
5. Physics - several levels
6. Space science - several levels
7. Directed study and advanced placement

As alluded to above, the actual offerings by grade level will depend upon decisions concerning "track" programs, nongraded programs, extent of independent study, size of classes, and innovations in science and science education yet to be developed or now in process. Despite these variables, however, certain objectives appear relevant for some time to come.

Objectives

The science department should strive to provide a breadth of basic concepts and a depth of scientific knowledge as well as a knowledge of the history of science. Each science teacher should: (a) help students become familiar with sound general laboratory techniques, (b) help students become acquainted with the history of science, (c) help students to develop a vocabulary of scientific terms, (d) help students to develop an inquiring attitude, (e) adapt course or courses to recognized needs of students, (f) help students to develop an appreciation of science as a means of dealing with life and its complexities, (g) help students to obtain a background of knowledge for: 1. choosing a profession, 2. growing toward maturity as people.

The staff should strive to help keep curriculum content, methods, and materials congruent with new knowledge and understanding.

The staff should encourage individual work in areas of student interest and on science projects in these areas.

The staff will help students develop the habit of using science as a way of knowing.

The staff should give major attention to the process of scientific inquiry as opposed to acquisition and retention of scientific knowledge. Recent criticisms of high school graduates mainly concern the lack of scientific experimental and research skills than lack of scientific knowledge.

Furniture and equipment

Since major emphasis will be placed on exploration and discovery, the furniture of the department will be laboratory oriented rather than classroom oriented. Each facility should be equipped so that it may serve as a classroom in which lectures and demonstrations are presented and as a laboratory in which students explore and search for their own answers to problems. The furniture chosen should be durable in construction, light in color, and designed with the comfort of the user in mind. Laboratory tables should contain ample counter space; water, electrical and gas outlets. As much wall space as possible should be devoted to laboratory stations, particularly if the laboratory and classroom areas are to be separate. Serious thought should be given to the design of laboratory stations that permit use also as classroom instructional spaces. Considerable savings could be realized were this possible.

Room space

Those science rooms housing primarily laboratory sciences (Chemistry, Physics, advanced science) should provide sufficient space for 20 students. There will be more free movement of students and of teacher than in the traditional classroom. Enough space should be provided so that open laboratory carts may be used to move laboratory materials into the teaching area. Counter space for models, aquariums, displays, etc. should be available.

Although desirable to have no science classes larger than 20, a more realistic number to plan for would be 24 or 25. Those science rooms housing Earth Science, Biology, and the like will not require the large, fixed equipment of the Chemistry, Physics variety, and so offer a greater variety of facility design more nearly reflecting the individual preferences of the science teachers who are to use them.

Storage space

Between each two rooms a storage area for chemicals, specimen, equipment, charts, and other materials should be included and should contain built-in shelves (adjustable) and cabinets. Space is also needed by the department for storing materials seldom used and those being held for repair.

Preparation room

In the preparation room, space will be needed to house a stove, refrigerator, and other equipment normally used in preparing and preserving laboratory specimen and materials. Adjacent to or as a continuation of the preparation room space, could be teacher offices for two teachers. A much more desirable plan would appear to be that of having all the teachers' offices and a conference area combined as a unit that makes up part of the central resource center.

Resource Center

The resource center should be the center of the science complex. It should include reference materials germaine to subjects being studied and soft seating to encourage students to use them. There should be independent study carrels, an area for viewing audio-visual aids, and a complex of individual and group project rooms for student projects that require more than a normal class allotment of time. The partitions would not be ceiling height, but there would have to be doors and locks. Part of the partition could be of glass for more adequate supervision. As stated above, teacher offices could be a part of this area.

Adjacent and accessible to those students involved with individual or group projects should be a supply room from which they could readily withdraw required equipment and materials. It is very important that they not have to go through classrooms or laboratories to reach the supply room. The room could be one of those between two other rooms with a door opening into the resource center.

Large-instruction area

An ampi-theater type space is necessary for large-group instruction (90-100 students). The area would be equipped with a stage, demonstration science laboratory station, and audio-visual media. A storage room should be provided to house the laboratory station (portable) and other equipment and materials.

Special considerations

The Biology program will require a greenhouse in which experiments relating to plant life and growth may be conducted. It should provide individual stall spaces for 25 students. Potting materials as well as a large number of plants will need to be housed in this facility.

Animal room

Since live animals will be used in many biological experiments, it is essential that space be provided to house them. Because of undesirable odors, this space should be located out of doors but easily accessible to the biology classrooms.

Botanical garden

Along with the animal room, and the greenhouse, a large area of ground space should be developed which may include a pond, swamp bed, flower beds, plants and trees. An important consideration in developing the site would be plans for preserving natural resources of this type.

Planetarium

The planetarium is a facility that can be used by elementary, junior and senior high schools in their science programs. It should accommodate between 100-200 students and should include a dome light, swivel seats and equipment. Adjacent to and as a part of the planetarium an observatory should be developed.

Work room

The science cluster should include a teacher's work room adjacent to the resource center. Equipment such as projectors, duplicating machines, typewriter and thermofax machine for making transparencies should be housed in this area.

Activities

In summary, the science faculty will plan a variety of teaching-learning activities to accomplish the objectives established by the department personnel. These will include: team teaching, individual study and research, projects, laboratory activities in large and small groups, lecturing, discussing, viewing demonstrations, note taking, writing research papers, reading and summarizing.

SITE AND SITE DEVELOPMENT

Selection of site:

1. For a school of 3000, a minimum of 60 useable acres - preferably rectilinear
2. Geologically suitable for building foundation, for building fields, for growing grass, trees and shrubs
3. Natural drainage
4. Availability of public utilities
5. Accessiblity to traffic arteries - not immediately adjacent to a main highway, airport, railroad, or other noise producing activity.

Site Development:

1. Make full use of existing natural aspects of the site for educational purposes (ponds, wooded areas, etc.) to include outside laboratories, ampitheater, stadium, etc.
2. Orientation of building in relation to drives, bus loading and parking areas, and physical education facilities. Bus loading and parking areas will depend upon the number of students riding buses and upon the number of teachers and students driving cars to school. Parking areas should be accessible for after school activities (concerts, athletic activities, parent nights, etc.).

   The size and number of physical education areas will be dependent upon the size of classes, the number of meetings for each class each week, and the availability of varsity athletic fields for physical education classes. The physical education areas should be as close to the school as possible without interferring with classroom instruction. Athletic fields available for limited use only should be peripheral to the physical education class areas. In a school of 3000, some of the physical education areas would be too far from the building to justify their use during a standard 40-45 minute period. A 60-90 minute period would be necessary to permit effective use of these areas.

SPACE REQUIREMENTS

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PREFACE

Within this report there are suggested alternatives relative to class size, use of teacher aides and grade groupings to the respective houses. It is recognized by the project that these decisions must be made by professional people in the Chelmsford Schools who will be charged with the responsibility for an effectively operated instructional system.

The opportunity exists for the Chelmsford faculty and administration to explore these alternatives against the objectives they propose for the school system. Some of the aims and goals of the system will require a committment to in-service education programs that properly equip staff with new tools for operating in a different mode than the conventional.

Scheduling techniques already being studied by (3) members of the school faculty will permit many of these alternatives to be examined as to their feasibility.

The physical model developed in the project provides another tool which offers improved communication for understanding alternatives and selecting that system which is best for Chelmsford. As soon as the architect is engaged further dialogue becomes available relative to the kinds of space that best fits the objectives of the Chelmsford school system.

The following specifications have been prepared with various alternatives for action by the Chelmsford School Committee. Remaining decisions regarding these specifications are dependent upon the goals of the school system and the resources that will be applied to the accomplishment of these objectives.

From the time of the printing of this document to the opening of the school in 1972 valuable planning time is provided for the educational leadership. The successful operation of the new school will be dependent upon how effective this time is utilized.

THE HOUSES

The five houses are planned on enrollments of 600 students in each of the houses. Groupings may be arranged on the basis of each house comprising random population of students from grades (9 to 12) or on the basis of grade level where a house becomes predominately one grade level.

The enclosed plan provides space on the combined grade system whereby students live within a house over a four year period. Each house provides instructional space for large, medium and small groupings.

Instructional areas for 25 students each should be grouped in threes in order to facilitate and encourage instruction for 50 to 75. Five instructional areas should be divisible into small classrooms for 10 - 12 students.

As programs are developed and large group spaces are used at optimum levels the use of teacher aides or technical assistants become feasible.

HOUSE A - 600 students

	Total sq. footage
17 areas @ 850 sq. feet	14,450
2 science areas @ 1000 sq. ft.	2,000
1 special classroom @ 1000 sq. ft.	1,000
1 typing @ 1000 sq. ft.	1,000
1 office practice @ 1200 sq. ft.	1,200
1 bookkeeping and steno @ 1200 sq. ft.	1,200
1 reading lab @ 500 sq. ft.	500
	21,350 sq. feet
Area for resource center, student activities, teacher offices, etc.	15,000
	36,350 sq. feet
Houses B,C,D,E are also allocated space similar to the above plan. Total space needs therefore in the 5 houses amount to - - - - - - - - - - -	181,750 sq. feet

Each house should provide the following areas:

Resource Center: 3500 sq. ft. for seating 60 - 100 students.

Individual study carrels; an area with tables for small group and individual project work; a soft-seating area for browsing and general reading; and area for viewing AV materials; an area for teacher aide, teacher, or other supervisory person who is available to assist students in their pursuits, check out materials, and maintain liaison with the instructional materials center.

Student Activities Center: 3500 sq. ft. with an additional*750 sq. ft. available for the preparation of foods for a snack bar and coin-operated food dispensors.

The students could go to this center during any free time to eat, converse with other students, or work individually or in groups at tables in the area.

A conference and office area for student body officers should be provided off the main center @ 300 sq. ft.

Teachers' Area:

Should include offices, work area, lounge area, conference area and dining area. Should teacher aides, clerks, and technical assistants be employed, office and work spaces must be provided for them. The total numbers to provide for could vary from 20-21 teachers with no assistants to 14 teachers, 14 teacher aides, 4 clerks, and 3 technical aides. Minimum space requirements would appear to vary from 3000 sq. ft. to 5000 sq. ft.

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* Central kitchen if provided should be located near or as part of the administration building. Combining food preparation areas could save in space required.

Large Group Instruction Area: 1800 sq. ft. for 150 students

Equipped for use of all kinds of AV materials in large group instruction.

A divisible area is at recommended because of duplication of equipment required and particularly because of the difficulty of sound isolation, one area from the other. Architecturally difficult to design one large area of this type that is equally functional when divided into two areas of the same type.

Administrative:

House Master or Assistant Principal office @ 200 sq. ft.; Conference room @300 sq. ft.

Reception and Secretary @ 150 sq. ft.

Guidance - two: one for girls, one for boys, each office @ 100 sq. ft.

Secretary serving both, office at 150 sq. ft., Reception area as well.

One room for individual testing and group testing up to 15; 200 sq. ft.

CENTRAL ADMINISTRATION

Principal: Office 200 sq. ft.

The principal is seen as spending about 3/4 of his time as a curriculum professional personnel coordinator. He should have the assistance of a full-time secretary, possibly two, and an administrative aide or intern. The success of a school of this size will depend to a greater extent than with a small school upon his abilities in the area of curriculum and that of working effectively with professional personnel.

The secretary's office and reception area should be 150 sq. ft. An extra secretary would need another 100 sq. ft., an administrative intern another 100 sq. ft.

Guidance Director: Office 150 sq. ft.

Secretary's office and reception area, 150 sq. ft.

Conference Room: 300 sq. ft. for 20 people.

To accommodate staff, departmental, and community group meetings. Accessible to and used by both the principal and the guidance director.

MAIN MEDIA CENTER

The American Library Association is now engaged in publishing its recently evolved and revised standards for school libraries. These standards include recommendations for instructional materials production areas as well as for electronic distribution areas.

The Resource Centers in the five houses should seat the minimum of 10% of the student body previously recommended for libraries. With the increased attention paid to research activities and individual and small group independent study activities, seating should be provided for another 5-10% in the media center itself. It would seem reasonable to provide an area of 2500 sq. ft. in the media center for individual study carrels, small group project work, and individual reading. Another area of 1000 sq. ft. should be devoted to research activities, individual and small group, and an additional area of 1000 sq. ft. for AV listening, viewing, and production activities by students.

Total area - 16,000 sq. feet

THE ARTS CENTER

Home arts, fine arts, industrial arts, dramatic arts, and music are related physically. This will probably mean that all of the subjects will be developed around the auditorium.

Auditorium and Stage Area

Size -	Seating area for 1000 -	7000 sq. ft.
	Apron and space for moveable seats	1000 sq. ft.
	Stage	2000 sq. ft.
	Stage Craft	500 sq. ft.
		10,500 sq. ft.

ART

1. Fine Arts Laboratories - two. Unit capacity 24 - 1500 sq. ft. each

   For all kinds of drawing and painting classes. No direct sun, high ceiling and an art studio "feel".

   Provide direct access to art patio and exterior circulation.

   Relate to central storage and office complex.

   a. Storage - two; 150 sq. ft. each. Desirable to locate near teaching station with direct access into fine arts laboratory.

2. Crafts Laboratories - two. Unit capacity 24 - 1100 sq. ft. each.

   Sculpture and ceramics activities.

   Relate to general arts laboratories and kiln room with direct access to exterior circulation, storage and kiln room.

   a. Storage - two; 150 sq. ft. each. Store tools and teaching supplies. Direct access to laboratory area.

   Convenient access for delivery of supplies.

   Zoned into wheel area, bench area with damp boxes and glazing area.

   b. Kiln Room - two; 150 sq. ft. each. Large kiln and drying racks.

   Convenient to sculpture glace area.

   Direct access to crafts laboratory and general arts laboratory

3. General Arts Laboratory. Unit capacity 24 - 1100 sq. ft.

   Instruction to cover a variety of craft areas.

   Locate adjacent to the crafts laboratories with direct access to exterior circulation, storage and kiln rooms.

   a. Storage - 150 sq. ft. Store tools and teaching supplies. Direct access to laboratory area.

4. Office Complex. Unit capacity 5, 450 sq. ft.

   Home base for teachers within the art complex. Open area subdividable by desk-bookcase arrangements and space dividers.

Adjacent to the fine arts laboratories, central storage room and conference seminar room.

Direct access to exterior circulation and conference-seminar room.

5. Conference-Seminar Room. Unit capacity 10, 150 sq. ft.

Small group seminars and conferences; teachers, students and parents.

Visual access from office complex.

Sound isolation.

6. Central Storage Room, 200 sq. ft.

Central storage for art supplies

Relate to office complex.

MUSIC

1. Choral Hall (tiered). Unit capacity 120, 1200 sq. ft.

Rehearsal and instruction in vocal music. Radial risers and 14' minimum ceiling height required.

Visual contact with office and ensemble rooms with direct access to each.

Chape and treat space for acoustic perfection.

Sound isolation.

2. Instrumental Hall. Unit capacity 90, 1800 sq. ft.

Used for band, orchestra rehearsals and instruction. Flat floor or tiered acceptable. 14' minimum ceiling height desired.

Accessible through double doors.

Visual contact with office, ensemble and practice rooms.

Sound isolation.

3. Ensemble Rooms; Unit capacity 20. Four at 250 sq. ft.

Used for rehearsal of smaller choral and instrumental groups, as well as instructional space for music appreciation, music theory-composition, and independent study.

Direct access from music hall.

Acoustic isolation required.

4. Practice Rooms. Unit capacity 1. Eight @ 100 sq. ft.

   Practice room for individual or in groups of two.

   Direct access from instrumental hall.

   Acoustic isolation required.

5. Storage room, 200 sq. ft. Auxiliary instrument storage room with instrument cleaning facilities (cabinet, sink, etc.). To store large instruments other than those which will be stored in the instrumental hall storage cabinets - sousaphones, typani, etc. Locate enroute from exterior circulation to instrumental hall for control and supervision by teacher. Double doors required.

6. Storage - Uniforms, 200 sq. ft. Adjacent to instrumental hall.

7. Music Library - 200 sq. ft. For books and departmental music folders.

   An independent study area for individuals and small groups.

   Adjacent to faculty offices with direct access.

INDUSTRIAL ARTS

1. Metal Shop - Unit capacity 24 - 2400 sq. ft.

   Metal-working instruction, lecture and demonstration.

   a. Storage - Metal - 100 sq. ft. - Relate to exterior circulation for delivery of materials and supplies.

   b. Storage - Tool - 50 sq. ft. - Secured storage for tools, supplies, etc.

      Relate to office area.

   c. Office - 160 sq. ft. - Desirable to combine with wood shop office with visual access to metal shop work area. (80 sq. ft. for each office)

      Subdividable by desk-bookcase arrangement or space divider.

   d. Classroom (divisible) - 720 sq. ft.

      Lecture and demonstration area for wood and metal instruction.

      Divided into two areas by use of operable wall. Panel-type operable wall preferred.

      Provide for complete darkening of room for use of AV materials.

      Relate to wood and metal shops with visual access to each.

2. Wood Shop - Unit capacity 24 - 2400 sq. ft.

   Woodworking instruction, lecture and demonstration.

   Relate to exterior access for delivery of materials and supplies.

   a. Storage-Tool - 150 sq. ft. - Secured storage for tools, supplies, etc.

      Relate to office area.

   b. Storage-Project - 150 sq. ft. Storage for student projects. Relate to finishing room.

   c. Storage - Project - 200 sq. ft. - Secured storage for adult education projects.

Adjacent to student project storage.

d. Storage-Wood - 200 sq. ft. - Vertical storage for wood supply. Provide exterior access to receive lumber supply. Relate to wood machines area for cutting and preparation of lumber for student projects.

e. Finishing Room - 150 sq. ft. - Finishing area for student projects and adult education. Provide visual access to spray booth area.

f. Office - 160 sq. ft. - Combine with metal shop office with visual access to wood shop work area. (80 sq. ft. for each office)

3. Graphic Arts Shop - Unit capacity 24 - 2000 sq. ft.

Graphic arts and photography instruction, lecture and demonstration. Relate to drafting room and provide convenient access from science complex for common use of photography laboratory.

a. Storage - 150 sq. ft. - Secured storage for tools, supplies, etc. Relate to office area.

b. Office - 160 sq. ft. - Combine with drafting office with visual access of graphic arts work area. (80 sq. ft. for each office) Subdividable by desk-bookcase arrangement or space dividers.

c. Classroom - 500 sq. ft. - To be used jointly for graphic arts and photography classroom instruction. Access from exterior circulation and graphic art shop.

Direct access to photography darkrooms.

d. Darkroom - Unit capacity 10-12 - 250 sq. ft. - Lab instruction in photo development processes.

Provide light trap between classroom and darkroom.

Typical counter and sink arrangement for photo developing, including space for photo enlargers.

e. Darkroom - Unit capacity 1-2 - 25 sq. ft. - Film loading room.

Adjacent to darkroom. Direct access from classroom.

4. Drafting Room - Unit capacity 28 - 1200 sq. ft. - Drafting instruction.

Lecture and demonstration.

a. Storage - 150 sq. ft. - Secured storage for paper, equipment and supplies.

Relate to office area and model room.

b. Office - 160 sq. ft. - Combine with graphic arts office with visual access of drafting room.

Subdividable by desk-bookcase arrangement or space divider.

c. Model Room - 200 sq. ft. - Individual student projects, air brush instruction and use, and model making.

Visual access from drafting room for student supervision.

Adjacent to storage and office areas.

5. Electricity-Electronics Laboratory - Unit capacity 24 - 1400 sq. ft.

Lecture and laboratory space.

Relate to science complex for common use for electricity and electronics instruction.

Direct access to exterior circulation and central prep-storage area.

6. Power Mechanics - Aero-space technology - Plastics, etc. Unit capacity 24 - 2400 sq. ft.

The designated use of this shop will depend upon the choices of teachers and administrators and the inclusion or exclusion of vocational education as well as other variables to be determined. Aero-space technology or plastics would appear to be more relevant for Chelmsford than would power mechanics.

Appropriate storage and office space must be included.

HOME ECONOMICS

1. Food Laboratory - Unit capacity - 1400 sq. ft. - Instructional space for food preparation, meal service, lecture and demonstration.
   Locate adjacent to social area and provide direct access through the use of an operable wall.
2. Social area. To provide learning experiences in hospitality and entertaining, home decoration, furniture arrangement and care.
   500 sq. ft.
3. Clothing laboratory - Unit capacity 24 - 1800 sq. ft.
   Instructional area for sewing and clothing instruction.
   Adjacent to social area. Provide direct access to the social area through the use of an operable wall.
4. Multi-use room (including children's center) for teaching personal, social and family relations, housing and home furnishings, child development, care of the sick, management and family economics.
   1200 sq. ft. Adjacent to nurse's suite.
5. Combination food-clothing laboratory - 1800 sq. ft. - For groups of 8-12 pursuing one semester courses of an orientation nature or specialized subjects.
   An operable wall should separate the two working areas (food, clothing).
6. Office Area - Unit capacity 4 - 400 sq. ft. - Home base for homemaking teachers.
   General office areas subdividable by desk-bookcase arrangements or space dividers.
   Easily accessible from all homemaking instructional spaces.
   Enter from exterior circulation.
   Adjacent to nurse's suite office.

A conference area for one teacher and 1-2 students. Could also serve as conference area for department teachers.

7. Central Storage Room - 200 sq. ft.

Storage of general homemaking supplies, as well as furniture, toys, etc. for child care and play activities.

Direct access to multi-purpose room and exterior circulation.

PHYSICAL EDUCATION

Boys

1. Gymnasium. Unit capacity 3500, 16000 sq. ft. Regulation main court with three cross courts. Clear ceiling height 22'.
2. Auxiliary Station, 2500 sq. ft., for tumbling, apparatus activities, etc.

   Auxiliary Station 2000 sq. ft., for wrestling, weight training, etc.
3. General classroom, 750 sq. ft., for general instruction, testing, health classes, etc.
4. Main Gymnasium Storage, 400 sq. ft., direct access to main Gymnasium. Serving apparatus activities area. Double doors, no threshold to interfere with movement of equipment.
5. Locker/Dressing Room. Unit capacity 150, 3500 sq. ft. Direct access to Shower/Toweling room, toilets, training team rooms and equipment issue. Relate directly to main campus circulation, thence to gyms, fields and to future pool through shower area. Separate wet and dry foot traffic. Visual supervision from office.
6. Shower/Toweling. Unit capacity 90, 900 sq. ft. Direct access to pool and Locker/Dressing room.
7. Toilets - one with direct access to Locker/Dressing room.
8. Seasonal Equipment Issue and Storage - one @ 150 sq. ft. Access from Locker/Dressing room and shower area.
9. Non-seasonal Equipment Storage - one @ 600 sq. ft., adjacent to Seasonal Equipment (8) or directly accessible thereto.
10. Team Spaces. Unit capacity 100. Two @ 2000 sq. ft. Access from Locker/Dressing and Shower/Toweling rooms. Adjacent to training room.
11. Training area. Unit capacity 4, 200 sq. ft. Direct access from Locker/

m

Dressing room and adjacent to team rooms.

12. Department Office Area. Unit capacity 5, 600 sq. ft. Visual supervision of Locker/Shower rooms. Include separate dressing area, toilet area, shower area.

Swimming Pool

A swimming facility, once considered almost a luxury item for a school, is now an important component for any well-rounded physical education program. Plans for new school buildings must now consider inclusion of a pool. In most school systems, the best procedure is to work out a cooperative arrangement for joint school-community use of the swimming facility. A pool in Chelmsford High School could serve as a minimum of two teaching stations the year 'round. A 25' x 75' pool would require approximately 5000 sq. ft.

Track

Where a large number of teaching stations is required (Chelmsford - 10 stations) it is possible to provide for different kinds of physical education activities. A regular indoor track facility located in a field house and appropriately designed can offer a different kind of activity space without adding excessive square footage.

Girls

1. Gymnasium. Unit capacity 1000, 10000 sq. ft. Regulation court with three cross courts. Clear ceiling height 22'.
2. Auxiliary Stations. Two at 2500 sq. ft.; one for dance correctives, etc., the other for tumbling, apparatus activities, etc.
3. General classroom, 750 sq. ft., for general instruction, testing, health classes, etc.

4. Main Gymnasium Storage, 400 sq. ft., direct access to gymnasium and to apparatus activities area. Double doors, no threshold to interfere with movement of equipment.

5. Locker/Dressing Room. Unit capacity 150, 3500 sq. ft. Direct access to Shower/Toweling area, toilets, and equipment issue. Relate directly to main campus circulation, thence to gyms, fields and to future pool through shower area. Separate wet and dry foot traffic. Visual supervision from office.

6. Shower/Toweling. Unit capacity 75 (individual shower stalls and drying cubicles) 1500 sq. ft. Direct access to pool (?) and Locker/Dressing room.

7. Toilets - one. Direct access to Locker/Dressing and Shower/Toweling rooms.

8. Seasonal Equipment Issue and Storage. 100 sq. ft. Direct access to Locker/Dressing room and Shower area.

9. Non-seasonal Equipment storage. 200 sq. ft. Direct access to (8), above.

10. Department Office Area. Unit capacity 5. 600 sq. ft. Visual supervision of Locker/Shower rooms. (Include separate dressing area, separate toilet, and separate shower stalls (2).

Outdoor Areas - A general guide for nimimum areas required for indicated or alternate uses:

Multi-purpose play areas, paved*	50,000 sq. ft.
Play fields, grassed	240,000 sq. ft.
Football playing field, grassed	160,000 sq. ft.
Football practice field, grassed	220,000 sq. ft.
Track grasstex, grassed	200,000 sq. ft.
Golf area, grassed	270,000 sq. ft.
Archery, grassed	80,000 sq. ft.
Baseball, grassed	160,000 sq. ft.
	1,380,000 sq. ft.

Includes tennis courts - an increasingly popular and beneficial activity of a large segment of our population.

SCIENCE

1. Biology Laboratories - 5. Unit capacity 24 - 1200 sq. ft. each.

   To include 24 student stations to facilitate both lecture and laboratory activities. Relate to "live" or animal house via central prep-storage area and student project area.

   Direct access to exterior circulation and central prep-storage area.

2. Live House - 100 sq. ft. - For animal and plant study by students and instructors.

   Accessible from prep-storage area and convenient to biology laboratories.

3. Chemistry Laboratories - 4. Unit capacity 24 - 1400 sq. ft. each.

   To include student laboratory stations for 24 students,as well as a separate lecture-demonstration area.

   Special design considerations should be given to the laboratory and lecture areas to facilitate the instructional activities that are common to each.

   Direct access to exterior circulation and central prep-storage area.

4. General Purpose Laboratory - 1. Unit capacity 24 - 1200 sq. ft.

   General purpose laboratory for chemistry and biology instruction.

   Direct access to exterior circulation and central prep-storage area.

5. Physics Laboratories - 2. Unit capacity 24 - 1200 sq. ft. each.

6. Student Projects Laboratories - 2. Unit capacity 15 - 800 sq. ft. each.

   Individual student projects on short and long term basis.

   Relate to prep-storage area and office area for visual control and supervision of project areas.

   Direct access to supplies and equipment.

7. Lecture Room - Unit capacity 100 - 1200 sq. ft.

   Lecture and demonstration for groups of 75 - 100.

   Tiered floor and fixed seating for maximum visibility of demonstration table.

   Provide for complete darkening and extensive use of AV materials.

   Central location with direct access to exterior circulation and prep-storage area.

   This space will be equipped with a projection dome and serve as a planetarium center.

   Projection booth desirable.

8. Greenhouse - Unit capacity 24 - 1200 sq. ft.

9. Prep-Storage areas - 2. Biology, Chemistry - combined 800 sq. ft.

   Physics, 300 sq. ft.

   Each with direct access to the relevant science instructional areas.

10. Office area - unit capacity 11 - 1100 sq. ft.

    Home base for science teachers.

    Subdividable by desk-bookcase arrangements or space dividers.

    Provide conference area for teachers, teacher-students.

    Visual access to student project areas.

The student project areas should be developed into resource centers as projects may be perceived as independent study activities as well as laboratory activities.

SUMMARY OF SPACES

Central area facilities		**Estimated square footage**	
Auditorium stage area	-	10,500 sq. ft.	
Industrial Arts	-	15,435 sq. ft.	
Home Economics	-	7,300 sq. ft.	
Science	-	21,500 sq. ft.	
Art	-	8,150 sq. ft.	
Music	-	5,400 sq. ft.	
Main Media Center	-	16,000 sq. ft.	
Physical Education	-	56,150 sq. ft.	
Central Administration	-	1,150 sq. ft.	
			141,585 sq. ft.
Total House Areas			
House A*	-	36,350 sq. ft.	
House B	-	36,350 sq. ft.	
House C	-	36,350 sq. ft.	
House D	-	36,350 sq. ft.	
House E	-	36,350 sq. ft.	
			181,750 sq. ft.
		Total net area - - -	323,335 sq. ft.
		Total gross area - -	431,113 sq. ft.

(Total gross area includes corridors, boiler room, toilets, custodial workshops, supply stoage, etc.)

* Includes Resource Center, student activities, teacher offices, etc.

VI

RECOMMENDATIONS

SIMULATION AS AN INSTRUCTIONAL TOOL

An educational resource likely to experience sharp growth is the use of simulation as a technique of instruction.

"To simulate, is, in part, to imitate, but it is something more. A mere imitation of a device with a change of scale is called a model. But when the task to be finally performed is changed or amplified at key points to make it more understandable, the process is termed 'simulation'.

We simulate those situations and operations which simplify the teaching process and give more practice at less expense than would be the case if the 'real thing' were used. Simulation can give 'on the job' training to persons who would otherwise have to learn by less effective, more abstract methods."*

Some of the possible benefits from the use of a model in simulation:

1. To identify how effective dialogue can be introduced into the planning process.
2. A more precise knowledge of how to identify conflicting objectives of various instructional areas.
3. An understanding of the constraints, real and unreal, that inhibit the instructional process.

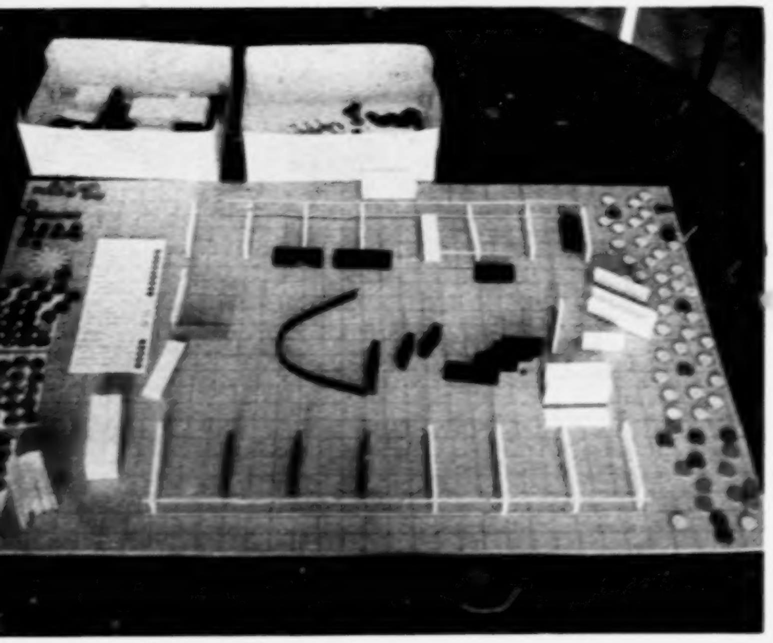
* National Society for the Study of Education: The Changing American School; Chicago; 1966; ppg. 103-4.

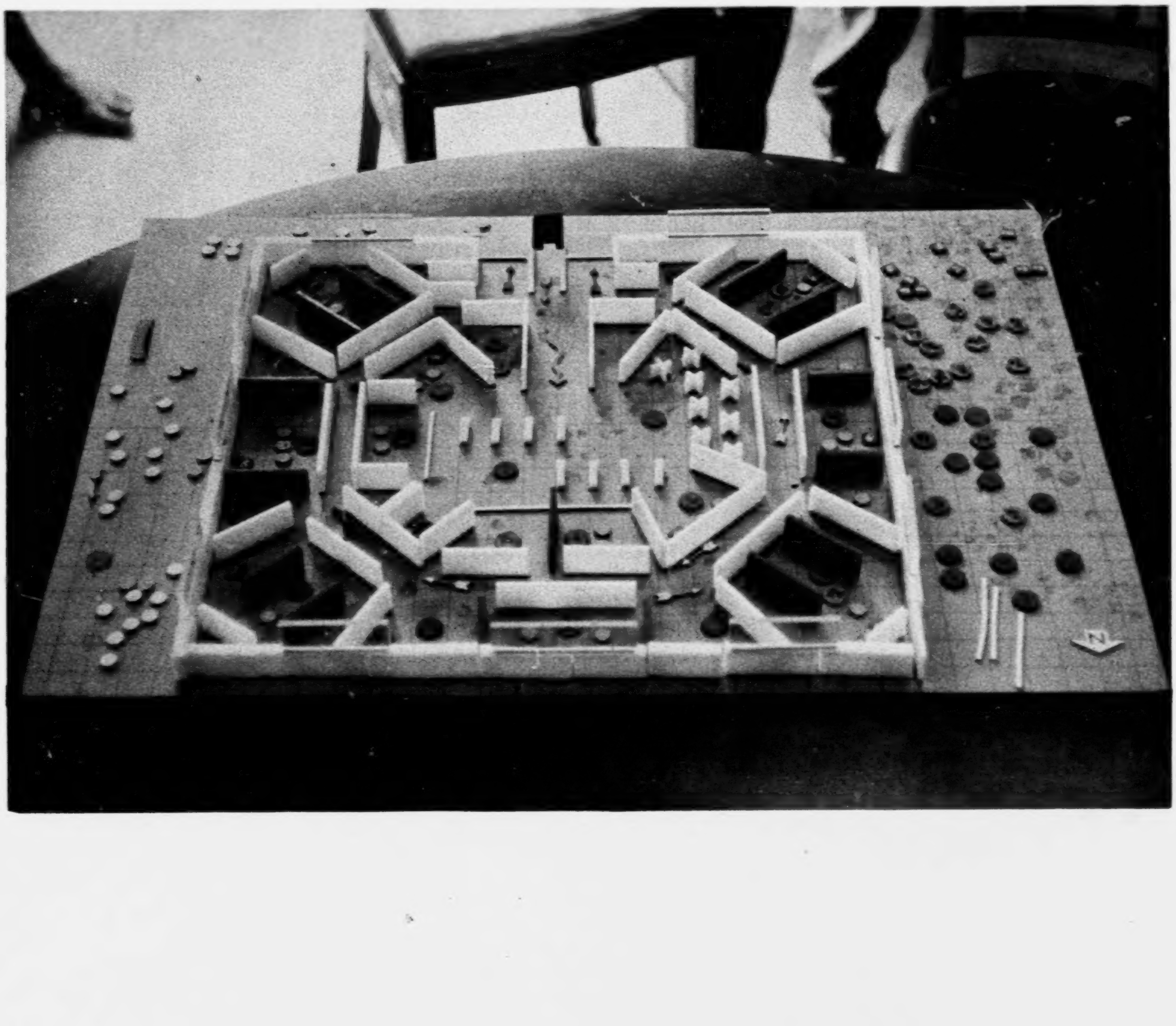
4. Recognition of interrelationships and linkages by various program areas. (Math-science, English-social studies and the like)
5. As an in-service education tool for new staff members.
6. To simulate before construction educational conditions as they affect the various elements of the system.
    - A. Teachers
    - B. Administrators
    - C. School planning team
    - D. Building and school committees
    - E. Students

The tentative programs of study currently being developed by the various curriculum coordinators and department heads should be tested against the model with respect to the feasibility of the respective plans.

The use of the model will contribute to the refinement of curriculum plans and also assist as an in-service education tool for staff members.

The physical model in various stages is illustrated in the following pictures:





UP-DATING STUDIES

1. Survey Data

With any type of forecast that may have been completed as part of the project it is necessary that these studies be up-dated. Enrollment projections, building plans, financial ability, are subject to change as the years unfold and new data becomes available.

With all the possibilities of error, the use of a carefully developed forecast based upon the best available data and techniques is superior to any alternative such as unsupported guessing, assuming a static enrollment, or assuming the recent trends will continue indefinitely.

The alterntives suggested in the study completed by Dr. John Marshall await new data derived from such factors as the residential dwelling unit growth and pupils per family kinds of information.

"The results of a school survey conducted by Dr. John Marshall in 1968, a part of the secondary school planning project (Title III), shows the need for the construction of a high school of 3000 pupils for September, 1972. This represents a first stage program with additional space being required by 1975 when a total of 4000 pupils will need housing in grades 9-12. As more data becomes available in the subsequent years the alternatives for a long-range building plan will be either to expand the 3000 pupil - four year high school to a 4000 pupil high school or to change its occupancy to a three-year high school.

2. Community Questionnaire

The Chelmsford Educational Advisory Board has met regarding the secondary school planning project throughout the year. Representatives have participated in visitations to other school systems which have included Mt. Kisco, New York; Newton Public Schools, Lexington Public Schools, in Massachusetts; and the Timberlane Regional High School in New Hampshire.

Specific interest was indicated by members of the advisory board relative to recreation, library and the community use of the new secondary school. Concurrent with this interest a questionnaire was developed to administer to the community. The project assisted in drafting of the questionnaire which was aimed at gaining the perspective of the community relative to questions of library, recreation and special areas where new facilities could serve better.

Currently the schedule provides for the questionnaire to be distributed and collected in the fall. It is recommended that findings from this study be analyzed and reported to the Chelmsford School Committee.

A copy of this questionnaire is included as Appendix B. Members of the Educational Advisory Committee include:

- Mrs. Patricia M. Brazee
- Mrs. Helen Coffey
- Mrs. Ann Donovan
- Ralph Hulslander
- Culver L. Kuhens
- Mrs. Dorothy Lerer
- Albert H. Marvin
- Mrs. Ellen Mellen
- Mrs. Shirley Pearlman
- Eric J. Poulin
- Thomas A. Shealy
- Dr. Henry Sills
- John Stansfield
- David Weintraub

3. Curriculum Changes

As curriculum coordinators actively pursue the establishment of educational objectives new techniques for instructional improvement will be discovered. More information on how children learn together with advances in technology promise changes in education. Research in education notably absent at the local level in education is emerging as a necessity to an efficient and effective school operation.

In a field such as teaching, which is not only complicated but rapidly changing - in knowledge base, functions and tools - provision for continuing education is even more important than in other lines of work. New ideas will be incorporated, new positions taken and new skills developed.

The role of the local school system then becomes two-fold - (1) to continuously up-date its faculty through in-service education programs, and (2) to establish itself in communication with outside influences on education such as industry, universities and government institutions.

EDUCATIONAL TO ARCHITECTURAL PLANNING

Architectural planning of schools is the process whereby specifications of educational needs are translated into the design and working documents that will make possible the construction of a building, the development of its site and the installation of its equipment.

Despite the fact that architectural planning as a procedural step, is conceived as following the educational planning step, it would be well to have the architect employed at this stage in order that he may be closely acquainted with the educational planning. As of this writing the architect has not as yet been engaged for the new Chelmsford secondary school. Because educational specifications are complete as of this document, special provisions should be made by the school committee and school building committee to assure accurate interpretation of the educational specifications.

The chief administrator of the school system, the school committee and the school building committee, together with the architect, should sit with the educational planning team for understanding of the information presented in the educational specifications.

The Chelmsford Secondary School Planning Project is scheduled for termination by contract in September, 1968.

As there is much that remains to be communicated relative to the new 3000 pupil high school in order to have it operable by September of 1972, the following is recommended:

1. That the Chelmsford School Building Committee employ consultant assistance. (Properly qualified consultants or university field services.)

2. That the consultants provide the following services:
   - (a) help to organize the planning
   - (b) help to structure committee reports
   - (c) act as liaison between school personnel and architectural personnel
   - (d) help to formulate administrative recommendations to the school committee and school building committee
   - (e) help with, or do, the precis writing and otherwise relieve the time of the chief school administrator for some of the other important duties consonant with his compensation.

   If consultant services are not employed, the administrator alone must assume the responsibility.

IN-SERVICE EDUCATION

The modification of the traditional high school to the "house plan" secondary school often referred to as a school within a school plan requires more than a physical plan for a school facility. The single unique advantage claimed by proponents of the school within a school type organization is that; better instruction will result from the team concept of instruction, both in subject matters and in the general life of the school.

It is important to note, however, that this concept will require a decided change in the basic teaching philosophy on the part of many and that the mere provision of a physical plant design will not, in itself, assure - or even precipitate - such acceptance.

Because new concepts are not limited only to new facilities it is recommended that many training situations be initiated immediately in existing buildings and in simulated conditions. The following represents a suggested listing of in-service activities:

1. Training and planning
2. Curriculum development
3. Media center usage
4. Optimization in staff utilization
5. Exploring schedule alternatives - (modular scheduling)
6. Technology as a process
7. Preparing instructional objectives
8. Conference methods in teaching
9. Games and simulation
10. Research techniques (application stage)

From the above listing it is readily apparent that these are on-going activities and require continuous planning and evaluation. In order, however, to provide for the needs in a secondary school of 1972 it is imperative that training programs be implemented at once.

Because the line of demarcation between pre-service and in-service education is narrowing, it is also necessary for school systems to cooperate with training institutions at the pre-service level. Through the project a teacher training concept was developed and is outlined in the appendix. This concept has since been incorporated in a proposal under the Education Professions Development Act.

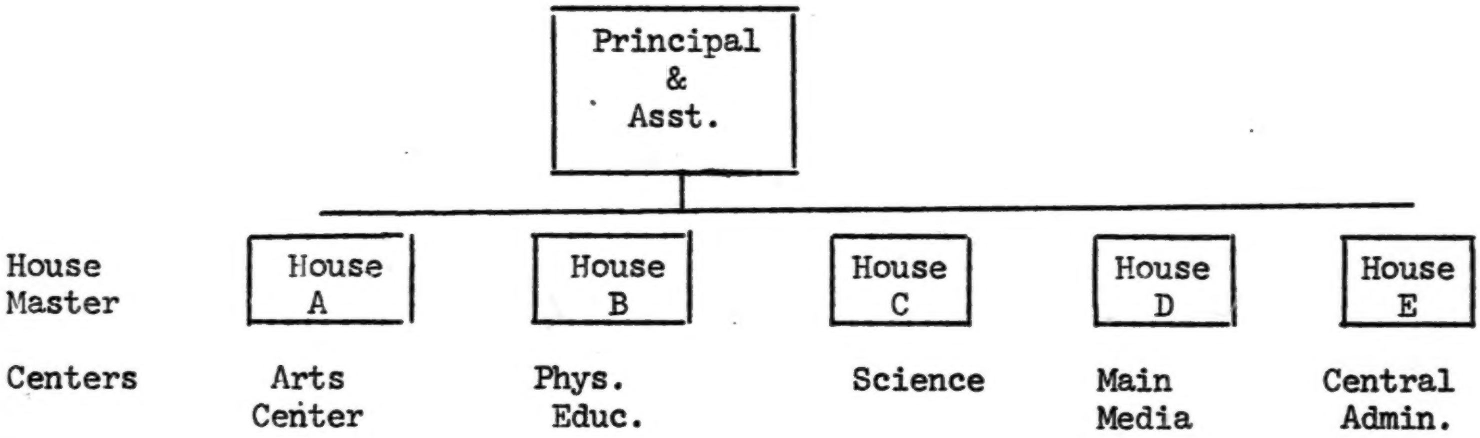
STAFFING AND ORGANIZATION

In reference to staffing in a complex such as the proposed new Chelmsford Secondary School special consideration should be given to the role of administration and in particular to the role of the principal.

A house plan for the new Chelmsford high school suggests that each house of 600 students have as its' administrative head a principal or better named a "house master". This person will assume all those responsibilities related to the operation of his house. He will serve as a subordinate to the central administrative head (principal) and will assume special responsibilities for the overall administration of the 3000 pupil school. Special activities may include any of the following:

Administrative Asst. - clerks, custodians, cafeteria, bus drivers, salesmen, visitors, etc.
External Relations - town, state, federal finances, foundations press, P.T.A., community, etc.
Personnel - counseling, attendance staffs, school nurse, police, juvenile authorities, teacher welfare, etc.
Activities - clubs, social events, performances, exhibits, athletics, etc.

These management functions may be delegated by the principal to any of the house-masters. Scheduling which has a very close relationship to program is categorized in the instructional improvement area and should be under the direct control of the principal. Wherever possible interns should be used in both the areas of instructional improvement and management activities. The following schema represents a possible outline for administering the new high school.



The following excerpt is from J. Lloyd Trump* on the role of the school principal in his unpublished article "Needed Changes for Further Improvement of Secondary Education in the United States".

"Today's principal averages a 50- hour week on school work and other activities directly related to it. He needs to show by the use of his time how important he regards the improvement in instruction. Regardless of whether his school is large or small, those activities should occupy three-quarters of his working time, or about 37 hours a week. The remaining time -- about 13 hours per week -- he devotes to other school tasks.

The principal has two basic clusters of problems: (1) How does he find time to improve instruction, how does he go about it, and how does he know whether he is successful? (2) Since he is in charge of the total educational enterprise for his building, how does he manage all the difficulties, operations, and opportunities he faces in such matters as discipline, attendance, pupil activities, guidance and testing, plant management, transportation, office management, cafeteria operation, public relations, teacher militancy, and opposition to higher taxes?

Here is how we recommend that the secondary school principal organizes a staff to answer those questions in the preceding paragraph. What is the organization to improve instruction? How does he handle the other problems that take so much of his time?

---

* J. Lloyd Trump is Associate Secretary of the National Association of Secondary School Principals, 1201 - 16th St., N.W., Washington, D.C. 20036.

First, we look at how the middle, junior, or senior high school principal handles the second cluster of problems, the ones to which he should give one-fourth of his time - 13 hours per week. The principal of a large school requires a variety of specially trained assistants, most of whom in turn supervise specially trained subordinates. They provide the principal with the information he needs and handle most situations.

The number of assistant principals varies with the size of the school: none up to 500 pupils, one for each 1000 pupils or major fraction thereof above that. That means a school with 1200 pupils has one assistant principal; a school with 2100 pupils has two, and so on."

VII

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BIBLIOGRAPHY

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VIII

APPENDIXES

TEACHER TRAINING

A SYSTEM CONCEPT FOR DEVELOPING TEACHER EMPATHY

Appendix A

TEACHER TRAINING: A SYSTEM CONCEPT

INTRODUCTION

Teachers use and buy instructional materials with which they are familiar - have confidence in applying. As instructional materials change more rapidly, demand and costs for teacher training both increase. This proposal outlines the development of a system for accomplishing an important aspect of teacher training at what promises to be lower cost with higher return on investment in teachers trained to use various forms of materials and curricula.

BACKGROUND

The teacher who is confronted with new instructional materials must learn what it is that is being taught - The Content, the sequence of steps by which the objectives are reached - The Tactics, and how students will react to The Materials - Empathy.* Of these three kinds of knowledge about new materials, content and tactics are relatively easy to make accessible to teachers. The materials display the content directly; a teacher's guide describes methods and procedures for dealing with the content. Moreover, conventional instructional methods are usually suitable for familiarizing the teacher with the content and tactics of new materials. Group instruction describing the materials and the teacher's guide are ordinarily sufficient.

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* From this point onward, this paper deals with ("Speech to Print to Phonics" materials) as a pertinent example, although the system is clearly applicable to many other materials.

Figure #1 summarizes the availability of curricula and methods for training teachers in content, tactics and empathy. The new instructional materials and the teacher's guide for these materials provide the curricula for familiarizing teachers with the content and tactics of the new program. Although audio-visual techniques are desirable media for communicating this information, conventional class instruction will suffice. Creating teacher-empathy for student responses to the new material is yet another matter. Empathy is important for successful teaching with new material but not readily communicated to teachers by means of conventional instructional methods.

Empathy - or identifying with the state of mind of another - is observable in the classroom when a master teacher is able to anticipate how students will respond to new information, leading questions, or objects of study. In fact, success in teaching depends critically on the ability of the teacher to judge how students will respond during the learning activity. If the ability to anticipate is lacking, as it usually is when new material appears, complete familiarity with content and tactics will be of little value to the teacher.

For those talented teachers who will readily anticipate student responses, many will be unreceptive to new materials and techniques until they have successfully done so. In either case, training of teachers is limited and not likely to develop quickly if content and tactics alone are disseminated. But how is a teacher to test and/or acquire confidence in anticipating how students will react to the experiences offered by "Speech to Print to Phonics" materials?

At least three difficulties are to be overcome in the preparation of teachers to use new material in a manner which anticipates students reactions. These are: costs, mobility of training facilities, and the development of new instructional techniques. Each of these is discussed here as a basis for establishing the rationale for the proposed teacher training concept.

Methods

As shown in Figure 1, the usual method of establishing satisfactory levels of teacher-empathy for students dealing with new material is observation. The teacher will typically observe a class being taught by a master teacher who is using the new materials. Such observation is effective if it is guided. However, this guidance is tutorial in nature, consuming such large amounts of teacher-trainee and master-teacher time that it is an impractical means of training large numbers of teachers. There is associated with observation little or no opportunity for the teacher-in-training to respond overtly to the classroom situation as it develops, nor is there in this method of instruction any feedback to the teacher-in-training. For example, the observing teacher may note the manner in which the master-teacher employs the new materials, but will not be required to select a course of action or even anticipate the response of the students to the instructional activity being observed. There is no opportunity for the observing teacher to state what should be done next as such a choice is being made in the classroom under observation. Although there is much value in observation, the absence of opportunity for response and knowledge of results makes that method of instruction highly inefficient. Needed, therefore, is a technique for training teachers to anticipate students responses to new material and provide corrective feedback and assessment.

Mobility

So long as observation is the principal method for developing empathy, teacher training must be conducted at facilities providing students and master-teachers. Thus, flexibility in the location of teacher training is limited to the places and times at which both may be found. Needed is a method of training teachers that reduce the constraints of time on the activities.

Costs

Even though the inflexibility associated with teacher observation of classes may be acceptable, there remains the overriding cost consideration. This occurs since there are usually limited numbers of teachers-in-training who may at any given time observe a master teacher teaching a class of students. Even when special facilities are available for observation from behind a one-way vision screen, the ability of the observer to see facial expressions and the physical reactions of students is severely limited for groups of more than 20 teacher-trainees. This means that observation, on which the development of empathy is dependent, is expensive where large numbers of teachers are to be trained - the critical situation in introducing new materials. Clearly, a system which permits groups of teachers as large as 50 or 100 to observe classes will greatly reduce the cost and time of teacher training.

One attempt to solve this problem is underway in Lane County, Oregon, where VTR is being used to expand the number of teachers who may observe classroom situations.*

* Instructor, March, 1968, Page 140.

Video tapes will greatly expand the number of teachers who can observe classes and permit flexible schedules for observation. Lacking, however, are techniques for ensuring that the observing teachers are active learners - making choices, anticipating and receiving feedback on the correctness of their activity. The approach proposed below employs VTR combining it with programmed material and a response system to provide observer involvement and feedback.

APPROACH

This proposal attempts to meet the technical challenge of training teachers in the use of new instructional materials with emphasis on critical skills not readily communicated by conventional techniques. A system is proposed which develops and assists teacher-trainees to anticipate the responses of students to new instructional material such as "Speech to Print to Phonics". Essential elements include:

1. Improved instructional methods providing teacher-trainees with active participation and knowledge of results.
2. Mobility and flexibility as to time and place of teacher training.
3. Reduced costs as a result of supplying classroom experiences in simulated conditions at the college.
4. Collection and analysis of data on teacher-training responses.
5. Continuous dialogue between local school system (televised classroom situations) and teacher training institution (responses to observed classroom situations).
6. Establishment of regional in-service education center (media-response) for specialized programs - (non-typical child).

Facilities

System facilities as shown in Figure #2 include a student response system providing programmed control of video-tape, 60 to 100 multiple-choice student response stations, response display meters, and response output records on magnetic or paper tape. These facilities permit the presentation of audio-visual software (described below) to large groups of teacher-trainees. The response capability requires that each teacher make choices, answer questions, and register opinions throughout the training program as guided by the programmed audio-visual software. The instructor of the group of trainees shown on Figure #2 monitors the participative learning activities of the teacher-trainees by means of the meters showing the numbers registering each of the multi-choice responses. The output device creates a record of each teacher-trainee for later analysis and evaluation.

These facilities, being more adaptable than the live classroom, afford greater flexibility in scheduling and thus reduce costs associated with training teachers. Moreover, the large number of teachers who may be instructed at the same time will further reduce cost while at the same time ensuring individual participation throughout the learning activity. This continuous participation and the record of responses are likely to improve the effectiveness of instruction by increasing involvement and providing the results of classroom activity to the teacher-trainees.*

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* When necessary, VTR alone may be used or motion picture film with responses recorded on answer sheets or machine-scorable cards.

Software

Here, as with all instructional systems, the crucial system element is the information presented by the display devices. Video tapes of a master teacher using "Speech to Print to Phonics" materials are presented via the program control of the hardware system. These recordings will show a master teacher and a class at close range as instructional materials are being used. Facial expressions, physical and vocal responses of the students will be shown at close range. Periodically the action will be stopped as multi-choice questions are presented to the teacher-trainees. Responses to these questions will be made by each teacher-trainee by means of the response devices. Thus, the instructor will be aware immediately of the distribution of responses from the meter readings at the control console. The data record tape will yield information on each trainee's response to each question. Such questions as the following are planned:

1. Which of the following reactions do you expect from the students? (Five alternatives)
2. Should the teacher divert her pattern of instruction in response to the question just raised by the student? (Yes or No)
3. Which of the following next steps is more appropriate for the teacher? (Five alternatives)
4. Which of the following is the most probably behavior of Mary (any particular student) to the events which have just occurred? (Five alternatives)
5. Which one of the following students will be able to answer correctly the question just asked? (Names of five students)

The tapes and questions presented to the teacher-trainees will have been obtained from VTR records of the master teacher, and typical classes.

From many hours of recorded instruction, taped sequences of instructional value will have been selected and edited to include questions such as those described above. It is, of course, possible to select taped sequences which present progressively more difficult choices for the teacher-trainees. Thus, the system may be programmed to help teachers develop skills in anticipating students reactions to the "Speech to Print to Phonics" materials. This will be aided by providing immediate feedback to the teacher-trainees through identification of the "best" response immediately following each question. Moreover, the system permits the use of special tapes presenting sequences from special groups such as the disadvantaged, superior students and those with physical handicaps.

The system proposed here will facilitate assessment of the initial and terminal abilities of teacher-trainees to anticipate students responses to instructional materials. Test sequences will yield responses recorded on the output device and analyzed by data processing equipment. It will thus be possible at the end of the training program to identify those teachers whose empathy is superior and those who may as yet be unprepared to use the new material effectively in a classroom.

The software, and integral part of this system, is likely to improve instruction by permitting it to be graded in difficulty and by providing knowledge of results to the trainees. Moreover, the same software will yield useful data on difficulties teachers encounter in anticipating how new instructional materials will be received by students.

Systems Operation

Standard Training

A sequence of programmed television tapes will be presented to large groups from whom response data will be obtained. The size of such groups may vary from 50 to 200 trainee-teachers who participate by recording their answers to questions as they arise during the presentation of the television tape. Standard or large group training can be carried out with software depicting average classes being taught one or more units of the instructional materials. A typical standard training unit would be a 30 to 40 minute sequence based on "Speech to Print to Phonics" units. Other standard training units would present classes using other materials for a comparable period of time. Teacher-trainees would thus observe and participate in instructional activities involving new instructional materials. These teachers would also provide data (Figure #3) describing their choices and responses required by the software and collected by means of the response devices. These data would be employed in assigning teachers to small group discussions or seminars following the standard training program.

Individualized Instruction

Data obtained during the standard training sequences would be evaluated to yield a score for each trainee. Scores provide a basis for classifying teacher-trainees in terms of their ability to anticipate instructional sequences and student reactions. This clarification permits a degree of individualization of instruction in small groups formed from those with similar skills as shown by their performance during the standard training sequence. In addition, the evaluation which may be performed by data processing equipment, can produce a print-out describing the performance of each group. Such information will assist the group leader in directing the work of the group and making it better to meet the needs of the teacher-trainees.

As shown in Figure #3, it is conceivable that some teacher trainees will, by virtue of experience or talent, display such empathy that further instruction will be unnecessary. These individuals either may be excused from further instruction or assigned to groups to assist other teacher-trainees.

In other applications, data obtained from standard training sequences will be of value as indicated in Figure #3. Teacher's manuals can be guided in their emphasis by the difficulties teacher-trainees encounter and record while they are participating in the large group instruction mode. Such manuals, based as they will be on reactions of relatively large numbers of teachers unfamiliar with the new instructional material, should be more useful than those based on an educated guess. For example, if a majority of the teacher-trainees first subjected to the proposed training system incorrectly identify the point at which there should be a change in activity, the teacher's manual can develop detailed guidance on this activity.

Data derived from large group instruction will contribute to product improvement. In some instances, difficulties encountered by the trainees may be such that they can be avoided by minor improvements. Where such is the case, early and quantitative data will be useful in making the program more effective and more accessible to more teachers.

DEVELOPMENTAL PROGRAM

General

A phased development program is proposed in order that each step may be evaluated before a subsequent one is taken. Figure #4 describes the order and time for each phase leading to a prototype.

Facilities

The following facilities will be needed along with the administrative and technical cooperation of each:

1. Chelmsford elementary school where "Speech to Print to Phonics" materials are being used by experienced instructors. Fitchburg State College. Chelmsford Elementary Schools.
2. Chelmsford television production facilities capable of creating television tapes in the classroom. Two (2) cameras (to be purchased) which can produce wide angle and close up views will also be needed.
3. Editing facilities for splicing tapes, (Fitchburg) introduce questions and produce copies of tapes. These facilities need not be located at the school where the tapes are produced.
4. Large group response system with programmer and data output capability (Fitchburg). It is desirable during prototype development that this system be capable of placing television tapes under programmed control. If this latter capability is not available, the tape will be edited to provide adequate response time following each question. The response system must be located in a facility where the data recording subsystem may be housed and where 5 to 8 small groups may be assembled for seminars and discussions.

Developmental Plan

Phase I: Prototype units

Figure #4 indicates that Phase I will begin with the production of television tape sequences obtained during instruction utilizing the "Speech to Print to Phonics" materials. These will be edited to include questions and tested with groups of teachers who are unfamiliar with the "Speech to Print to Phonics" materials.

Data obtained during testing of the prototype program (using the response system) will be used to refine the tapes and improve the approach taken in the development of the other prototype units.

Phase II: Additional Units

Two additional units will be developed as in Phase I, unless modified. These units will be tested and refined.

Phase III: Evaluation

Will be noted that Phase III begins with a small effort concurrent with the beginning of Phase I. This parallel effort will develop a criteria that will be used in the evaluation of the effectiveness of the proposed instructional system. These evaluation materials will be employed when the three units being developed have been refined and will again be used as these units are presented for further test in several teacher's colleges. Evaluation will also consist of a determination to the degree of which the proposed system produces data of value in writing teacher guides.

Manpower Resources

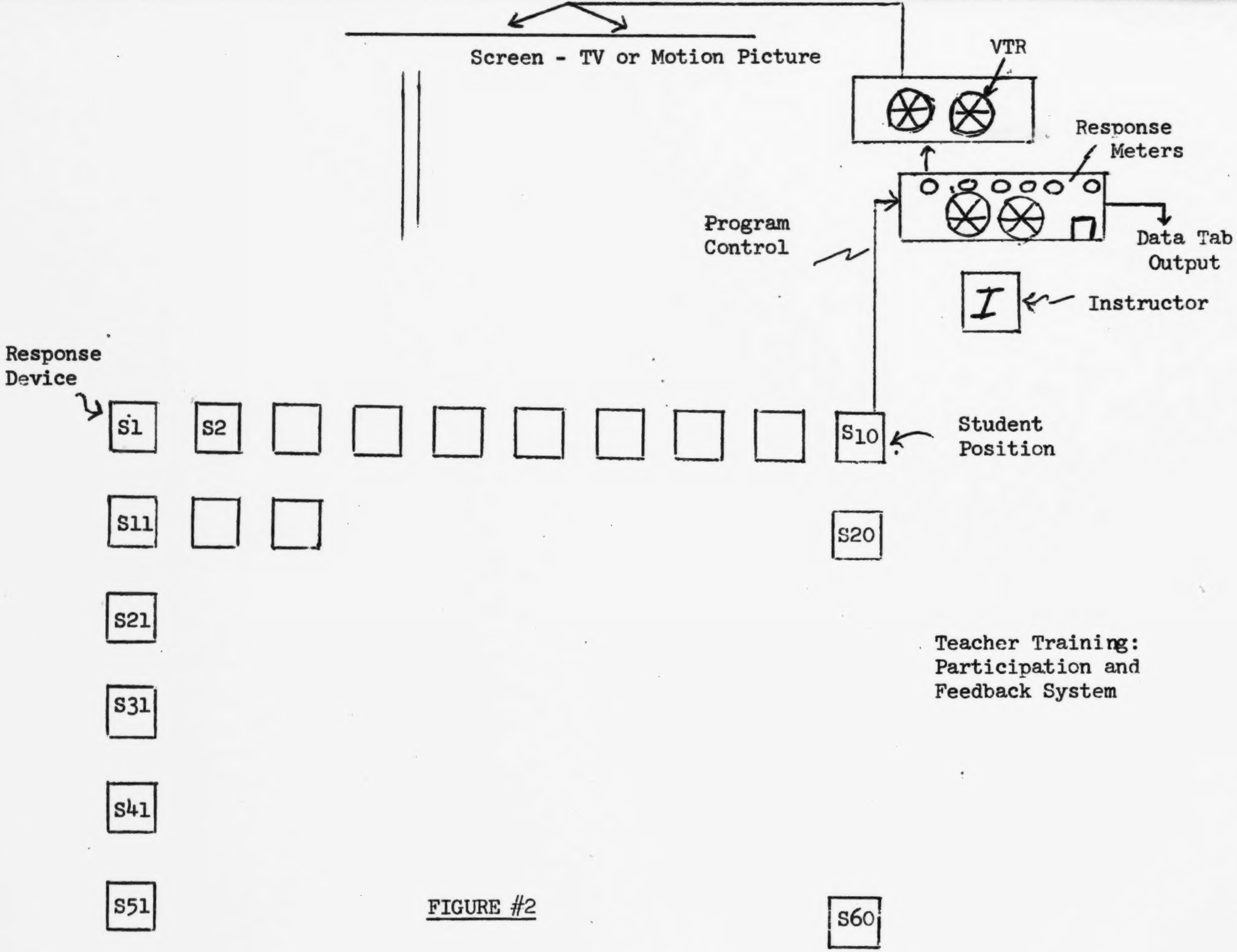
Key talent in the proposed programs will be individuals who are experienced in audio-visual programming. Such individuals will be required throughout the six months duration of the program; one will be assigned full-time and the other half-time. In addition, support personnel will be needed as follows:

1. Instructor and Assistant for the VTR classroom (Chelmsford) programs.
2. Technicians to assist in operating the equipment during taped productions and in editing tapes. (Fitchburg & Raytheon).
3. Consultants for guidance in the use of "Speech to Print to Phonics" (Chelmsford).
4. Data analysis (Raytheon).

FIGURE #1

TRAINING	CURRICULA	AVAILABLE METHODS
Content	The Materials	Conventional
Tactics	Teachers Guide	Conventional
Empathy	None	Observation

Teacher Training: New Material

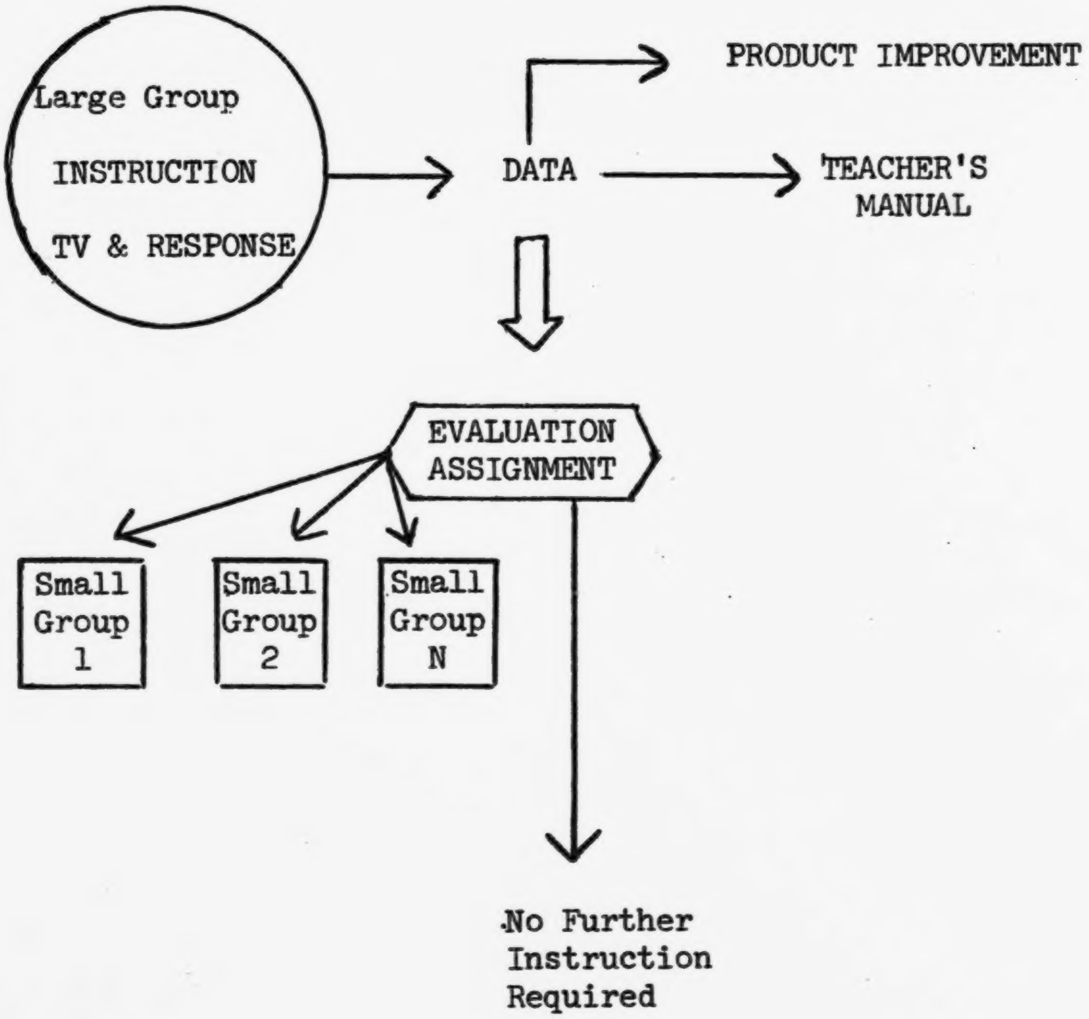

Screen - TV or Motion Picture
VTR
Response Meters
Program Control
Data Tab Output
I
Instructor
Response Device
S1
S2
S10
Student Position
S11
S20
S21
S31
S41
S51
S60

Teacher Training:
Participation and
Feedback System

FIGURE #2

FIGURE #3

SYSTEM OPERATION


Large Group
INSTRUCTION
TV & RESPONSE
DATA
PRODUCT IMPROVEMENT
TEACHER'S MANUAL
EVALUATION ASSIGNMENT
Small Group 1
Small Group 2
Small Group N
No Further Instruction Required

COMMUNITY QUESTIONNAIRE

Appendix B

EDUCATION ADVISORY COMMITTEE

COMMUNITY QUESTIONNAIRE

(Check the number of answers that are applicable)

LIBRARY

1. How can school libraries provide better services to the adults and children of the community?

( ) 1-1 Allow school library facilities to open after school hours, Saturdays and vacations

( ) 1-2 Coordination of school and town libraries through cross-cataloging

( ) 1-3 Geographically locate school and town libraries near or on the same site

( ) 1-4 Other - list -

AUDITORIUM

2. In planning a new secondary school facility an auditorium-stage area is being considered. What uses might you make of this auditorium-stage area?

( ) 2-1 Rehearsal for chorus

( ) 2-2 Attending lectures and other assembly-type activities (programs, meetings)

( ) 2-3 Dramatics and musical productions and rehearsals

( ) 2-4 Community concerts

( ) 2-5 Other - list -

INFORMATION ON RESPONDENT: Number in family____ Ages of Children____, ____, ____, ____, ____

RECREATION

3. If school facilities (indoor and outdoor) could be expanded to serve the community better with afternoon, evening or weekend programs, what kinds of activities would you like to see provided?

( ) 3-1 Tennis

( ) 3-2 Golf

( ) 3-3 Swimming

( ) 3-4 Group activities (basketball - baseball)

( ) 3-5 Exercise clubs

( ) 3-6 Other - list -

SPECIAL

4. Are there any special areas or programs that could be provided in a new secondary school that could be of assistance to you in your educational endeavors?

( ) 4-1 Arts and crafts facilities for adults

( ) 4-2 Music and language listening facilities

( ) 4-3 Film programs on occupations and employment opportunities in the area

( ) 4-4 Discussion groups on topics of interest

( ) 4-5 Other - list -

CHELMSFORD HIGH SCHOOL PLANNING SCHEDULE

Appendix C

CHELMSFORD SECONDARY SCHOOL PLANNING PROJECT APRIL 30, 1968

Tentative PLANNING SCHEDULE FOR NEW SENIOR HIGH SCHOOL

Phase	Major Steps	Objectives	Estimated Time Required	To Be Completed By
EDUCATIONAL PLANNING				
	Determination of need; capacity,grades to be served			
	Review of program, courses, methods			
	Site selection and acquisition			
	* Selection of architect for project			
	State approval of general proposal ("Building Needs Conference")		IN PROGRESS	
	Staff conferences on needs: space, comfort, equipment, and relationships			
	Written statement of requirements			
	Local approval			
	State approval of educational specifications			
		Completed, approved educational spec.		Dec.1,1968
BUILDING DESIGN				
	Study and interpretation of site data and educational specifications			
	Schematic plans, alternatives			
	Staff conferences		15 months	
	Preliminary drawings			
	Local and state approvals			
	Outline specifications & estimate			
	Equipment lists begun			
	Engineering, specifications			
	Local and state approvals			
		Final working drawings and specifications		March,1970
CONTRACT AWARD				
	Advertise for bids		2 months	
	Receive bids; study and compare			
	**Award contract			
		Construction begun		May, 1970
CONSTRUCTION, SITE DEVELOPMENT AND EQUIPMENT				
	Supervision provided to protect owner ("clerk-of-the-works")			
	Equipment ordered, received and installed		28 months	
	Site developed			
		Building completed and occupied		Sept.,1972

* Planning funds required here

** Construction funds required here